Highlights

- The EquiAmi Training Aid (ETA) is commonly used in training and rehabilitation programmes.
- There were no significant effects of the ETA on group mean kinematics in walk and trot
- Individual horses' responses to the ETA were variable and gait dependant.
- Therefore, practitioners should observe the individual's response to the ETA.
- Suitability of a training aid should be judged according to its effects on an individual horse

Abstract

The EquiAmi Training Aid (ETA) is a popular training and rehabilitation tool, however knowledge about its effect on the equine gait is lacking. Understanding of its effects on equine kinematics, and the clinical relevance of these effects is vital to promote optimal use of training aids within training and rehabilitation programmes. Therefore, this study aimed to determine how the ETA influences horses' gait kinematics at walk and trot. Eight horses walked and trotted in-hand with and without the ETA. Optical motion capture was used to measure forelimb and hindlimb pro- and retraction angles, withers-croup angle, and stride length. Separate repeated-measures ANOVAs in each gait were used to assess the differences between gait kinematics and stride length variability with and without the ETA. The ETA did not significantly influence the horses' kinematics in walk or trot, however, individual differences in the effect of the ETA on the horses' angular and linear kinematics were found, with variation between gaits within the same horse observed. The ETA does not have the same effect on every horse, and its effect can vary within the same horse between gaits. Therefore, the individual characteristics and needs of the horse must be considered when applying training aids.

Keywords: equine training aid, rehabilitation, EquiAmi, gait kinematics

1.Introduction

Selection of optimal exercises to elicit specific movement patterns aimed at supporting appropriate muscular development is a key factor in the design of successful training and rehabilitation programmes for horses. Currently, various training aids are available, intended to enhance the quality of ground schooling sessions for training and rehabilitation purposes. Examples of training aids are side reins, the Pessoa training aid, the Equiband System, elastic Thera-Bands and the EquiAmi Training Aid (ETA). Anecdotal evidence supports their use [1], but there is relatively little scientific evidence on their effects on the horse's kinematics [2,3,4] to assist trainers or physical therapists in selecting the most appropriate training aid for the horse to achieve a particular training or rehabilitation goal.

To date, research has focussed on changes to head, spinal, and limb kinematics, including stride length and speed that are elicited by training aids [2,3,4]. In practice, training aids are selected with a view to eliciting particular responses depending on their construction. For example, the Pessoa training aid comprises a loop that attaches to a lungeing surcingle, runs behind the hindquarters, and attaches to the bit, has been shown to reduce trotting speed, stride length, head angle, lumbosacral extension [2], and *longissimus dorsi* activity in trot [3]. The Equiband System, which consists of a band that runs under the horse's trunk, reduces roll, pitch and mediolateral displacement in the thoracolumbar region in trot [4]. Side reins that attach from lungeing surcingle to the bit, alter the head and neck position of the horse, which influences limb kinematics and ground reaction forces [5] and thoracolumbar spinal kinematics, but the differences depend on the head-neck position adopted by the horse [6]. Several models of training aids, including the Pessoa, Equiband and ETA consist of a loop that surrounds the horse's hindquarters. Studies to date have primarily focussed on their effect on the horse's back kinematics [2-4]. However, as the horse's back and limb kinematics are coupled in the quadrupedal back system [7], with changes in limb movements influencing back movements [8,9] it could be hypothesised that if the training aid influences the horse's back kinematics, a corresponding change to the limb kinematics would be observed. To promote optimal use of training aids, their effect on both limb and back kinematics must be known.

The term 'training aid' infers that these devices can be used as interventions to improve the training of the horse. In the dressage test, the quality of paces is a judged directive, as is balance, engagement of hindquarters and collection [10]. The quality of the horse's paces can be identified at an early age; judges award higher marks to young horses that display greater fore- and hindlimb stance and swing duration, forelimb maximal retraction and hindlimb maximal protraction among other characteristics that indicate strength and balance [11]. Although gait quality may be innate, the horse may improve its strength, balance, and ability for collection with training [12]. In addition, training aids may be used as a sensory facilitation aid to re-establish correct muscular activation as part of a rehabilitation programme [2]. Training aids may produce differential responses depending upon gait used during the training session, surface and direction of travel [3], and the horse's behavioural response and conformation [13]. Therefore, understanding the influence of training aids on limb and back kinematics in both walk and trot and in horses of differing conformation may provide useful guidance for equestrian trainers' decision-making.

The Pessoa and ETA training aids are of similar design; each consisting of a rope that surrounds the horse's hindquarters and attaches to the bit. The ETA uniquely has a so-called 'self-centring loop' that ensures that the pressure on the hindquarters and the bit is equal on the left and right sides. The ETA's hind and front-end loops can be adjusted separately and attach to a training roller. The manufacturer states that the ETA is designed to encourage the horse to work with a "soft, rounded outline", encouraging "lifting of the withers and engagement of the hind limbs" [14]. Theoretically, this position is a desirable working posture to support the spine during movement as it requires activation of the core, thoracic sling and *iliopsoas* muscles [7,15]. In addition, as the Pessoa training aid bears several similarities in its construction to the ETA, it is possible that the ETA also influences spinal and limb kinematics as is observed with the Pessoa [2]. No empirical evidence currently exists on the mechanism of action of the ETA, and the manufacturer's claims have not been validated.

Therefore, the aim of this study is to investigate the effects of the ETA on the kinematics of riding horses in-hand at walk and trot. By understanding its influence, evidence-based guidelines of how and when to use this training aid can be developed. The objectives of this study were to test whether the ETA "lifted the withers" by increasing the maximum withers-croup angle and "engagement of the hind limbs" by altering the protraction-retraction angles and to record the individual responses of the horses' angular and linear kinematics to the ETA. It was hypothesised that significant differences would be seen in the stride length, protraction-retraction angles of the hind limbs, and withers-croup angle.

2. Methods

2.1 Horses

Eight healthy horses were used in the study. The demographics of the sample population are described in Table 1. All horses were in moderate work at least four days per week. Horses were only included if they had worked in the ETA at least three times (for total of 30 minutes in walk and trot) before the start of data collection to ensure they were acclimated to the equipment. Horses were required to display no overt lameness on a straight line trot up, should not have been treated for lameness within 60 days prior to data collection. All were considered sound by their owners. The owner/manager of each horse was required to give informed consent and ethical approval was granted by the University Ethics Committee (ETHICS2021-02-LR).

Table 1. Demographics of the sample population. Discipline pertains to the normal competitive discipline or use of the horse.

Horse ID	Age (years)	Breed	Primary discipline
1	9	Irish Sport Horse	Show jumping
2	12	Irish Sport Horse	Show jumping
3	12	Brazilian Warmblood	Eventing
4	11	Thoroughbred	Hunting
5	6	Irish Sport Horse	School horse
6	8	Thoroughbred	School horse
7	8	Warmblood	School horse
8	13	Thoroughbred	Dressage

2.2 Data collection

All data collection took place on a straight track in an indoor arena with a Prowax fibre and sand surface (Andrews Bowen Ltd., Singleton, U.K.). Eight motion capture cameras (Miqus M3, Qualisys AB, Gothenburg, Sweden) on tripods were positioned on the right side of a 15-metre length track that was marked out using ground poles. The three-dimensional capture volume was calibrated using a calibration frame that was positioned in the middle of the track and a standard wand to track the position of the markers at 240 Hz. The coordinate system was defined as the x-axis parallel to the direction of travel, the y-axis positive to the right, and the z-axis pointing up.

Each horse was equipped with its own bridle with a snaffle bit, a training roller with woollen padding but no saddle pad underneath, and with brushing boots on the four limbs. Twelve spherical reflective markers (19 mm diameter) were applied to the horses' right side (positions detailed in Figure 1) with double-sided tape. These were affixed to the lateral coronary bands of the right fore and hind feet, dorsal border of the right scapula, spinous process of the fifth thoracic vertebra (withers), spinous process of the fourth lumbar vertebra, and root of the tail, cranial end of the right trochanter of the femur, right *tuber coxae*, and mid *tuber sacrale*. All markers were placed by the same trained physiotherapist. The horses were handled by their usual handlers (unique to each horse) throughout the exercise. The horses first warmed up at walk, trot and canter on the lunge for a total of 10 minutes; the first five minutes without the ETA and the remaining five minutes with the ETA. The ETA was fitted according to the manufacturer's guidelines by the same person for each horse.

All horses walked and trotted with and without the ETA in-hand led on the left side of the track. Each horse's trial consisted of three valid runs (and nor more than five runs) within each condition (ETA or control), in walk followed by trot, whereby the condition without the ETA acted as the horse's own control. The start condition for each horse was randomised by a random number generator. Horses were allowed to walk and trot at their preferred speed and the handlers were instructed to limit their interference with the gait pattern of the horse and the position and movement of the horse's head during the data collection. Run speeds were obtained using a laser-activated timer at the start and end of the track. Walk speed was 1.25 ± 0.1 m/s and trot was 2.8 ± 0.2 m/s. Runs differing more than 0.2 m/s to the horse's first valid run at the same gait were eliminated and repeated. Runs were discarded if they were outside of the required speed limits or if there were any interruptions in the performance of the horse during the trial (e.g. spooking).

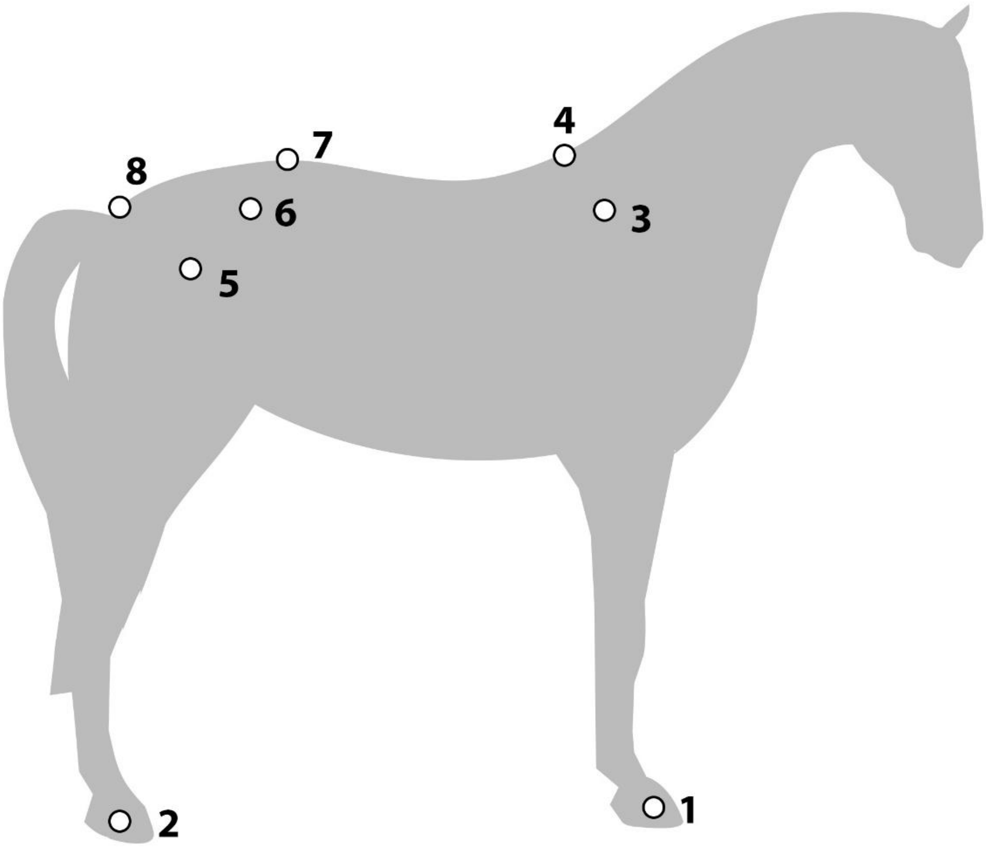


Figure 1. Anatomical marker locations for measurement of the spinal and limb kinematics with ETA shown. Nine markers were attached to: lateral coronary bands of the right (1) fore and (2) hind feet, (3) dorsal border of the right scapula, (4), spinous process of the fifth thoracic vertebra (withers), (5) cranial end of the right trochanter of the femur, (6) right tuber coxae, (7) mid tuber sacrale, (8) spinous process of the fourth lumbar vertebra, and (9) root of the tail.

2.3 Data analysis

The three-dimensional displacement of the motion capture markers from each horse's trial were exported from Qualisys Track Manager (v2020.2, Qualisys AB, Gothenburg, Sweden) into MATLAB (R2020b, The MathWorks, Natick, Mass., USA) for further processing. Each run was processed separately. The marker trajectories were filtered using a fourth-order zero-lag recursive Butterworth filter with a cut-off of 10 Hz. The vertical displacement of the hind hoof was differentiated to estimate its velocity. A custom script was used to split the data into strides based on the period between two subsequent minimums of the hind hoof vertical velocity in walk and trot. The data were then time-normalised using linear interpolation to period of the stride (0-100%) [16,17].

Four strides within each run were analysed for each horse, starting from the second complete stride, to give 12 strides per condition within each gait. Within each stride, the stride length, pro- and retraction angles for fore and hindlimbs, and withers-croup angles were calculated (Figure 2). The stride length was calculated in metres as the difference between the final and initial positions of the hind hoof marker in the x-axis within a stride. The hindlimb retraction angle was calculated within each stride as the maximal angle formed by the line joining the right *tuber coxae* marker to the hind hoof marker relative to the vertical. The hindlimb protraction angle was calculated as the minimal angle using the same definition. Similarly, the forelimb retraction angle was calculated as the maximal angle formed by a line joining the right scapula marker to the right fore hoof marker, relative to the vertical and the forelimb retraction angle as the minimum of the same angle.

The withers-croup angle was calculated as the angle formed by a line joining the mid *tuber sacrale* to the withers marker relative to the horizontal axis. The minimum and maximum values of the withers-croup angle was extracted for each stride. Values of 180° indicate level withers-croup, values less than 180° indicate higher croup than withers, and values above 180° indicate higher withers than croup. As horses' own conformation may influence these parameters the comparisons between the ETA and control (Figure 3) are most useful to gauge the effect of the ETA on the individual horse.

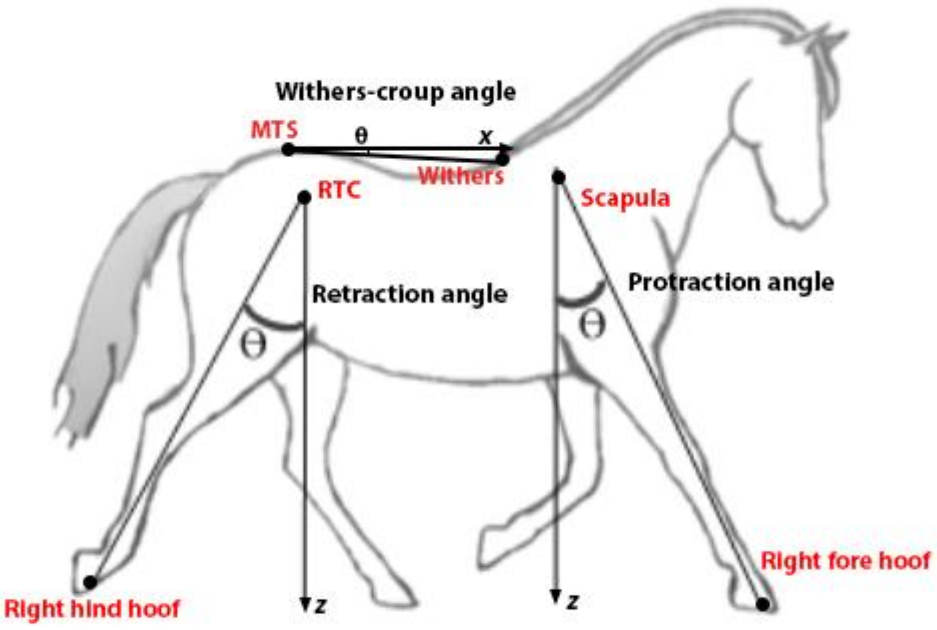


Figure 2. Angles calculated within each stride. Retraction angle of the forelimb was calculated as the maximal value of the angle formed by a line joining the scapula marker to the right fore hoof marker

relative to the vertical; protraction angle was calculated as the minimum value of this angle. Protraction angle of the hindlimb was calculated as the maximal value of the angle formed by a line joining the right *tuber coxae* (RTC) marker to the right hind hoof marker, relative to the vertical. Retraction angle of the hind limb was calculated as the minimal of this angle. Withers-croup angle was calculated as the angle formed by a line joining the mid *tuber sacrale* (MTS) marker to the withers marker, relative to the horizontal.

The average of the stride length, pro- and retraction angles and the minimum/maximum withers-croup angle were calculated for the four strides within each run, and the mean for the three runs within each condition and gait, respectively, were calculated for the horse's trial. Descriptive statistics were reported for stride length each horse (see Table 3). To describe the individual response of each horse to the ETA, the angle time-series mean and standard deviation were plotted within each gait and condition for each horse in Figure 3.

The means for each condition within each gait were tested for normality using a Shapiro-Wilk test in Each variable was normally distributed. To assess whether the ETA influenced any parameter within each gait, a repeated-measures ANOVA was performed on the variables within each gait in SPSS (version 26, IBM Corp., Armonk, NY, USA). Significance was set at p <0.05 and effect sizes were reported as partial eta squared (eta^2). Given the small sample size, the normality of the data were checked by examining scatterplots of the standardised residuals of the models in each gait. These were found to be normally distributed, therefore, the model was deemed appropriate.

3.0 Results

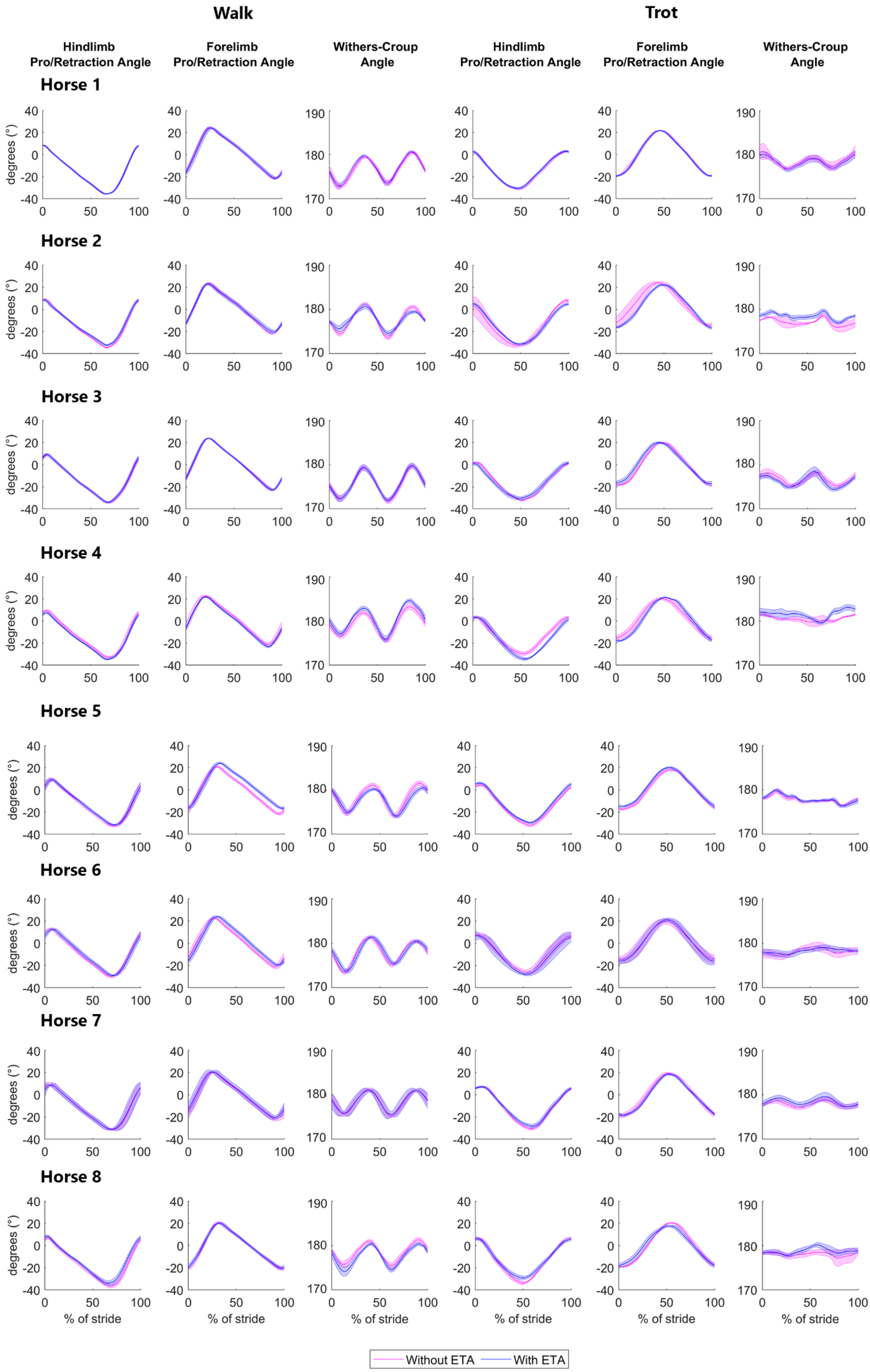
The mean linear and angular kinematic variables within each gait and between conditions are reported in Table 2. The mean linear and angular kinematic variables within each gait and between conditions are reported in Table 2. In walk, the ETA did not significantly influence stride length (F (1) = 5.85, P = 0.06, n^2 = 0.46), hindlimb protraction (F (1) = .14, P = .72, n^2 = 0.02) or retraction (F (1) = 2.56, P = .15, n^2 = 0.27), forelimb protraction (F (1) = 1.31, P = .29, n^2 = 0.41), or retraction (F (1) = 4.85, P = .06, n^2 = 0.07), or withers-croup minimum (F (1) = .56, P = .48, n^2 =0.07), and maximum (F (1) = .53, P = .49,). Similarly, in trot the ETA did not significantly influence stride length (F (1) = .98, P = .12, n^2 =0.12), hindlimb protraction (F (1) = .13, P = .73, n^2 =0.00) or retraction (F (1) = .001, P = .001, n^2 =0.02), forelimb protraction (F (1) = .002, P = .96,), or retraction (F (1) = .17, P = .69,), or withers-croup minimum (F (1) = 1.33, P = .29, n^2 = 0.16) and maximum (F (1) = 4.18, P = .08, n^2 = 0.37).

Table 2. Mean ± standard deviation of the variables within each gait and each condition. Angular variables are reported in degrees. Stride length is reported in metres.

			Hindlimb		Forelimb		Withers-croup angle	
Gait	**Condition**	**Stride length (m)**	**Protraction (°)**	**Retraction (°)**	**Protraction (°)**	**Retraction (°)**	**Maximum (°)**	**Minimum (°)**
Walk	Control	1.93 ± 0.11	9.61 ± 1.85	-33.64 ± 2.64	22.17 ± 1.35	-22.52 ± 1.19	181.55 ± 0.37	174.31 ± 1.90
	ETA	1.87 ± 0.12	9.46 ± 1.53	-32.49 ± 2.47	22.74 ± 1.36	-20.11 ± 2.56	181.26 ± 1.34	173.94 ± 1.35
Trot	Control	2.60 ± 0.12	5.67 ± 2.34	-30.54 ± 2.06	20.42 ± 1.61	-18.16 ± 2.04	183.37 ± 1.14	180.40 ± 1.01
	ETA	2.53 ± 0.20	5.88 ±2.68	-30.56 ± 1.68	20.39 ± 1.25	-18.44 ± 2.18	182.97 ± 1.69	178.91 ± 1.94

Table 3. Mean ± standard deviation of the stride length in metres for each horse within each condition.

Gait	Condition	Horse 1	Horse 2	Horse 3	Horse 4	Horse 5	Horse 6	Horse 7	Horse 8
Walk	Control	1.89 ± 0.09	1.92 ± 0.14	2.01 ± 0.14	1.94 ± 0.08	1.87 ± 0.13	2.15 ± 0.09	1.88 ± 0.07	1.77 ± 0.09
	ETA	1.92 ± 0.06	1.74 ± 0.12	1.90 ± 0.12	1.98 ± 0.04	1.77 ± 0.19	2.11 ± 0.10	1.82 ± 0.12	1.74 ± 0.07
Trot	Control	2.53 ± 0.04	2.75 ± 0.06	2.49 ± 0.08	2.47 ± 0.08	2.51 ± 0.10	2.77 ± 0.28	2.56 ± 0.20	2.74 ± 0.07
	ETA	2.44 ± 0.16	2.53 ± 0.11	2.29 ± 0.07	2.75 ± 0.14	2.48 ± 0.04	3.05 ± 0.29	2.27 ± 0.05	2.49 ± 0.09



Walk
Trot
Hindlimb Pro/Retraction Angle
Forelimb Pro/Retraction Angle
Withers-Croup Angle
Hindlimb Pro/Retraction Angle
Forelimb Pro/Retraction Angle
Withers-Croup Angle
Horse 1
Horse 2
Horse 3
Horse 4
Horse 5
Horse 6
Horse 7
Horse 8
degrees (°)
% of stride
Without ETA
With ETA

Figure 3. The individual responses to the ETA in walk and trot plotted relative to the time-normalised (0-100%) stride cycle. Solid lines indicate the mean of the trial, while the standard deviation is indicated by the shaded area around the solid line for each condition.

4. Discussion

The Equi-Ami Training Aid (ETA) did not significantly influence the group mean stride length, fore- or hindlimb pro- or retraction angles or the minimum and maximum withers-croup angles in walk (p = 0.676) or trot (p = 0.572). As the maximum withers-croup angle was not significantly different in either gait between the ETA and control, the ETA did not appear to "lift the withers" when horses were considered as a homogenous group. In addition, as the protraction angle of the hindlimb was not significantly different between the ETA and control in either gait, the ETA did not significantly increase the "engagement of the hindlimbs" for the group. Group trends may become apparent with a larger, more homogeneous sample of horses. Within this group of horses, a differential response to the ETA was observed between individuals (Table and Figure 3), which suggests that the ETA may influence horses differently depending on individual characteristics.

The ETA is advertised to stimulate the horse to engage their hindquarters and lift the withers [14]. The evidence presented in this study does not support those claims generally, however, in practice, neither would it be appropriate to conclude that the ETA has no effect given the individual nature of the changes. As shown in Figure 3, the ETA may have an effect on the pro- and retraction angles, as well as the variability of the pro- and retraction of the fore and hindlimbs during walk and trot. In some cases, the ETA increased the stride-to-stride variability (e.g. Horse 6 and Horse 7), while in other cases, it reduced the stride-to-stride variability of the angles (e.g. Horse 2). The stride-to-stride variability indicates the stability of the gait, whereby increased stride-to-stride variability may indicate loss of stability [18]. At first glance, loss of stability may be perceived as detrimental. Indeed, unstable gait may be more energetically demanding for the horse [19], and may reduce the desired attributes of rhythm and regularity. However, increased variability may be indicative of exploration of new patterns of motor control that can result in altered gait kinematics [20]. In addition to the increase in variability, the plots in Figure 3 show that subtle changes in the shape of the angle time-series occur with the ETA relating to time shifts in the peak angles (e.g. forelimb protraction of Horse 2 and Horse 4) and changes in the shapes of the curves (withers-croup angles for several horses in trot). It is unclear whether these changes are too subtle to be visually perceived, or if these changes are biologically significant. In addition, the conformation, gait quality and training age may influence whether the ETA is beneficial or detrimental to the horse's gait quality. As the responses of the individual horses to the ETA were so diverse, and varied between gaits, it is important to consider the responses of the individual to the ETA in deciding whether or not to use it within a training or rehabilitation programme.

The construction of the training aid should be a key consideration when assessing its function and application for a particular horse. The EquiAmi has a front loop that connects to the surcingle from the side, runs through the bit, and connects to the surcingle between the horse's legs. Its back loop connects to the surcingle from the side and surrounds the hindquarters. The EquiAmi, therefore, influences the horse's head-neck position and the relationship between the front and hind end by providing a proprioceptive stimulus. While the constraints on the front and hind end potentially limit undesirable postures and movement patterns (for example, high head carriage), the data presented here would suggest that the adaptation of the individual to the constraints imposed on their interlimb coordination during locomotion is not uniform. The horse can be likened to a complex system, whereby the coordinative reaction to the training aid is non-linear (not predictable). As the individual horse adapts to the training aid, they may elicit movement patterns that take into consideration their unique structure and function, such as their conformation and posture, behavioural characteristics during training, or their relationship to the handler. From this perspective the individual nature of the responses to the training aid are not surprising. Therefore, the results of this study underline the importance of assessing whether the training aid has a desirable effect on the individual horse's gait and posture.

The horses in this study were fitted with the Equi-Ami after warming up, but at halt. The length of the apparatus was not changed between walk or trot. Although no significant differences between gaits were found, individual horses reacted differently according to the gait. Although a key limitation of this study was the lack of data to describe the horses' head and neck position, previous studies have found that a fixed head-neck position influences stride length and back flexion-extension significantly in walk but not in trot [21]. Four of the eight horses showed smaller stride length in walk with the EquiAmi, and four showed smaller stride length in trot (with three of these being those with smaller stride length in walk). Therefore, it follows that practitioners should monitor the fit of the EquiAmi against the desired outcomes during the training session. In addition, the appropriate fit of the EquiAmi may differ between gaits, and between horses, as the different responses shown here suggest.

The withers-croup angle indicates the posture of the horse within the gait cycle. The manufacturer claims that the ETA should encourage greater "engagement of the hindlimbs", which is related to greater propulsive activity of the hind limbs. In walk, the horses' maximum withers-croup angle was about level (around 181°) and minimum indicating lower withers than croup (nose-down trunk orientation) (around 174°) with equivocal differences between the ETA and control conditions. In trot without the ETA, horses maintained a level or higher withers than croup (nose-up trunk orientation), reflected by minimum and maximum values at or above 180°. Remarkably, the ETA did not increase the nose-up orientation of the trunk. However, the individual analysis of the horses' withers-croup angle shows that many of the horses did not demonstrate any appreciable changes between conditions or gait. The equivocal differences between the ETA and control for many of the horses seem to suggest that the ETA does not change the dynamic pose of the trunk to a nose-up orientation, associated with a change in impulse ratio between fore and hindlimbs to elicit greater hindlimb propulsion [22]. Marked differences in individual horses suggests that the ETA may have a detrimental effect on the horse's posture in certain cases.

Trials in this study maintained a consistent within-subject speed to decrease the bias of speed on the horses' kinematics [23,24]. In contrast, Walker et al. (2013) allowed horses to self-select trot speed when investigating the effects of the Pessoa training aid, and found that trot speeds were significantly slower with the aid (2.92 m/s compared with 3.01 m/s). Gómez Álvarez et al. (2006) found a decrease of 2.0-6.1% in stride length at the same speed when walking with side reins in different head and neck positions. In combination with a shortened diagonal distance [24] and a shortened frame [25], a shortened stride length is an indicator for gait collection. In this study, it was not possible to measure the head and neck position, however, smaller stride length (Table 3) with the ETA was observed in both walk and trot in several horses (Horse 2, 3, 7) indicating a more collected gait. Additionally, the horses in this study were walked and trotted on a straight line, in comparison to Walker et al. (2013), who examined the horses while being lunged on a circle. Previous research has shown significant differences in spinal kinematics between trotting on a straight line and on a circle [26,27] and therefore further studies should examine the influence of straight line or circle locomotion on the influence of a training aid.

The results of this study suggest that more work is needed to establish any common effects of the ETA. In this non-homogenous group of horses, the responses to the training aid were not consistent between individuals. Therefore, rehabilitation and training programs should be adapted to every horse's individual physical, behavioural and sport-specific characteristics and include a variation of exercises and training techniques, which can all influence the horse's biomechanics in a different way.

As established in management of human athletes and patients, such approach is favourable to attain most optimal results in both training and rehabilitation programs [28].

The rehabilitation program should suit the individual athlete, their conformation and the injury. In certain cases, it is desirable to reduce some of the variables measured here, such as decreasing hindlimb retraction angle for horses with proximal suspensory desmitis, provided the limb maintains its total protraction-retraction angle [29]. The ETA did decrease this angle in several of the horses, however, it was increased in others. Therefore, caution must be taken with the use of the ETA to ensure that the results elicited by the training aid are favourable for the individual and their treatment plan. It must also be considered that sport horses often require strength and neuromotor control in varying postures both within discipline (e.g. between collected and extended gaits of dressage) and between disciplines (e.g. between dressage and cross-country phases of three-day eventing), meaning that training consistently towards one specific posture might not be sport specific or conditioning the horse adequately.

It must be noted that the effects of the ETA on the working posture of the horse depends on the behavioural reaction of the horse towards this training aid and the appropriate use of the ETA by the handler [13]. In this sample size, different behavioural responses to the ETA were seen in the horses, of which two horses showed an aversive working posture when walking and/or trotting with ETA. Horses were habituated to the ETA with at least three sessions prior to the data collection. However, these horses were not necessarily regularly trained with the ETA. The horses in this study ranged from competition sport horse to riding school horses, which may also explain the differences in the horses' reactions to the ETA. No veterinary diagnosis or knowledge of previous pathology was available for this population of horses beyond the owner's assertation that their horses were considered sound and had not seen a veterinarian in the 60 days prior to the study. These factors may influence the horses' response to the ETA, and may form the basis of future studies that consider a wider range of factors when assessing the suitability of a training aid for the individual horse. The kinematics observed in this study may have resulted from the horses resisting the effect of the ETA, which appears to be a negative response in terms of the horse's mental and physical state [30]. In order to attain the most favourable influence of training aids, observation of the horse's behaviour (for example, evasive behaviour towards the training aid) when using these and adapting the training cues according to this behaviour are key [31]. Until such time that further studies can establish under which circumstances and/or for which horses specific effects (if any) are achieved, practitioners should continue to assess horses on an individual basis.

5. Conclusions

In a group of non-homogenous sport horses, the Equi-Ami Training Aid (ETA) did not induce any significant differences in linear or angular kinematics in walk and trot. At the individual level, there were notable changes in the horses' stride length, pro- and retraction angles of the fore and hindlimbs, and withers-croup angle, however, these were not consistent between individuals or, in many cases, gait. Therefore, when using training aids, such as the ETA, the horse should be examined on an individual basis with the training or rehabilitation goals in mind and the suitability of the training aid should be assessed considering its effect on the horse's kinematics.

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