BEHAVIOURAL AND PHYSIOLOGICAL DIFFERENCES IN HORSES RIDDEN IN BITLESS AND BITTED BRIDLES:
A student research proposal

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Introduction

From when horses were first tamed as a source of milk and meat 15,000 years ago (Waran et. al. 2002) to our modern day society where horses have become our companions used for pleasure, a variety of methods designed to control the horse have existed. During mounted activities, there became a need for a control mechanism to stop and steer the horse, harnessing its movement for the benefit of the rider. It has been supposed that the very early horseman relied upon nothing more than a halter made from leather or woven fibres (Edwards 2000).

It was in 2300 BC that the first bits were introduced, consisting of straight bars made from hardwood (Edwards 2000). With the effectiveness of a bit to control movement in the horse evident, the material used to craft them developed into metal (Edwards 2000). Bits consisting of twisted bronze bars were introduced in the fourteenth century BC, and jointed bits closely resembling the modern snaffle in the tenth century BC (Waran et. al. 2002). While the bit has been supplemented and enhanced to meet specific requirements over the many years of its existence, the basic design and form of control has remain unchanged. Even today, the bit is used by a vast majority of equestrian enthusiasts as the principal method of control for all riding disciplines. As safety is an issue becoming closely monitored in the equine industry, humans require the comfort of knowing that the horse can be controlled when riding, hence the reason why bits are used in the mouth (a greatly sensitive site) despite the fact they are a potential source of enormous discomfort (McLean et. al. 2005)

There are four main categories of bits used for horses: the Snaffle, Weymouth, Gag and Pelham (Edwards 2000). Each of these categories is based upon pressure on one or more points on the horse's head and mouth. These points include the lips, bars, palate, poll, chin and tongue (Waran et. al.

2002). The lips, which include the corners of the mouth, are a highly sensitive area for pressure to be applied. The bars of the mouth are the space between the first pre-molar and third incisor on the lower jaw (Evans et. al. 1981). This highly sensitive bone area of the lower jaw is covered with fibrous tissue approximately 2mm thick which has been called a 'modified periosteum' or skin of the bone (Cook, 2003). Pressure on the palate or roof of the mouth can occur, but will frequently create soreness, injury and resistance from the horse if applied harshly (Edwards 2000). Poll pressure is exerted on the fleshy part of the head directly behind the ears and is utilised by gag bits in particular but generally by any bits with leverage. The chin, or chin groove, is another highly sensitive area located directly behind the bottom lip towards the cheek (Evans et. al. 1981). The tongue is the most basic pressure point, with every bit placing at least a small degree of pressure on the tongue (Evans et. al. 1981).

The severity of a bit depends not only upon the points of pressure, but also on such aspects as the diameter and texture of the mouthpiece (Wyse et. al. 2000). The thinner the mouthpiece, the greater the severity as the pressure on the bars is stronger due to the greater pressure per square inch on a smaller contact area (Wyse et. al. 2000). In regards to texture of the mouthpiece, whilst most are smooth, other textures such as twisted wire, rollers, slow twists and chains greatly modify (usually increasing) the pressure and severity exerted by the rider (Wyse et. al. 2000).
The major fault of the bit as a tool for communication and control is, except in the hands of a master horseman with an unshakably independent seat, the bit has been seen to cause pain (Cook 2003). Even a rider with 'light hands' will always require some pressure on the bit and as the mouth is one of the most highly sensitive parts of the horse's anatomy this has been shown to cause pain in the horse (Cook 2003).

Although bits remain the main form of control and communication during the majority of equitation, riders have reported problems in their horses that may have been caused by the use of a bit (Cook et. al. 2003). These problems range from mild to precarious behavioural responses such as bucking and spinning, rearing, and bolting (Cook et. al. 2003) to training concerns such as a lack of flexibility, energy or forward motion and leaning on or being above the bit (Cook et. al. 2003). Hyper-reactive responses, which are expressions of a horse's attempt to take flight from a situation causing stress, have also been noted in horse behaviour (McLean et. al. 2005). For example, extreme extension and flexion of the neck with raising or lowering of the head as a hyper-reactive response to bit pressure (McLean et. al. 2005). This will then result in the rider losing some control, as the direct contact is lost (McLean et. al. 2005). Evidence of pain can be a root cause of undesired behavioural responses, including those mentioned above, when riding horses (McLean et. al. 2005). One such example of pain resulting from a horse being unable to free itself from the pressure of a bit due to overly tight reins is an occurrence called 'bridle lameness'. The constriction from the bit results in the longitudinal alignment of the body becoming crooked, causing an irregular rhythm during movement that can mimic the appearance of lameness (Mclean et. al. 2005).

As well as the undesired behavioural reactions that have been associated with the bit, a physiological condition called facial neuralgia has been found to be a common cause of the Headshaking Syndrome in horses and directly linked to the use of a bit (Cook 2003). The Headshaking Syndrome's name itself arises from the most prominent symptom of violently and sporadically tossing the head vertically during exercise (Cook 2003). Other common signs can include sneezing and nose-blowing, rubbing muzzle constantly on foreleg or striking at muzzle with foreleg, 'grazing on the fly' (constantly snatching at nearby grass or plants), Photophobia or hypersensitivity to bright light, and Blepharospasm or rapid and noisy eye blinking (Cook 2003).
The above symptoms are all signs of the condition facial neuralgia, neuralgia meaning 'pain across the nerve' (Cook et. al. 2003). In the case of headshaking horses the pain involves the trigeminal nerve, which is the principal sensory nerve in the face (Cook 2003). The trigeminal nerve has three branches; the mandibular branch the first, supplying sensation to the bone, teeth, tongue, chin, lips and gums of the lower jaw, the maxillary branch supplying the bone, teeth, hard and soft palates, nasal mucous membranes, lips and gums of the upper jaw and the third named the ophthalmic branch, supplying the eye and eyelids, tear glands, forehead and nasal mucosa (Cook et. al. 2003). Collectively, these are the areas affected by facial neuralgia and

this information supports a thoroughly researched hypothesis by Cook that may explain the harmful relation of the bit on the trigeminal nerve (Cook 2003). This theory proposes that the use of a bit in horses triggers both intense and constant pain (trigeminal neuralgia) along the path of the trigeminal nerve (Cook et. al. 2003). This pain may be transmitted directly or indirectly (referred pain) to the brain. As the trigeminal nerve involves three branches ending in the many different senses described above, any one branch that has direct contact with a bit, such as the mandibular branch where the bars are located (Cook 2003), may spread the pain signals to any other branch of the same nerve (Cook et. al. 2003). This results in pain or irritation over areas of the head that do not have direct contact with a bit (Cook 2003). Using the bars of the mouth as an example (Cook et. al. 2003), acute pain caused by bit pressure transmitted directly to the brain accounts for the uncontrollable head tossing, whereas referred pain via the maxillary nerve to the muzzle explains the rubbing, sneezing, and nose-blowing (Cook 2002). If the pain is referred along the ophthalmic nerve, reactions such as Photophobia and Blepharospasms can be triggered (Cook et. al. 2003).
In response to these issues, there are new concepts emerging that focus on bitless methods. Six years ago, Dr. Robert Cook introduced the 'Bitless Bridle', a design based on a collective method of steering and control not previously utilised in any other bitted or bitless bridle. Cook's design is proclaimed to be a 'pain-free' rein aid, based on pressure across the poll, sides of the face, and bridge of the nose (Cook 1999). The pressure is spread over a larger surface area, that Cook claims to effectively and gently 'push' the horse in the desired direction, as opposed to a bit, which is said to focus the same pressure on a smaller and highly sensitive area of the horse's mouth (Cook 1999).

Although Cook's design is classified as a bitless bridle, it should not be confused with pre-existing bitless variations such as the hackamore, which in its true form is nothing more than a bosal (Britton 1995), which is a Spanish word meaning 'muzzle'. These are constructed with a plaited rawhide noseband, a simple one-ear headpiece and a heavy knot securing the noseband under the lower jaw from which the reins are connected (Britton 1995). When pressure is applied, it affects the noseband and is simply a restraining backwards pressure that can also encourage the horse to lower its head (Britton 1995). The mechanical hackamore, also called the German or jumping hackamore, acts much in the same way as a curb bit. The pressure of a mechanical hackamore works on the nose, poll and chin (if a curb chain is used). The wider the noseband, the less severe the hackamore is than one with a thin noseband (Cook 2005). The length of the shanks will also affect the severity due to the leverage involved. The longer the 'lever', the greater will be the pressure that is transferred to the mouth of the horse hence magnifying the pull of the rider (Boettiger 2002). Whilst used in a correct and soft manner the hackamore does provide good longitudinal communication for stopping and slowing down, lateral communication for turning and flexing is inadequate (Cook 2005). While these bridles do not include a bit in their design they have the potential to cause great damage if used in an improper manner, particularly those that incorporate metal under the jaw, chain nosebands, or extra long shanks (Jahiel 1996). The potentially painful leverage in combination with harsh materials of such mechanical hackamores can break a horse's nose and/or jaw with surprisingly little effort from the rider (Jahiel 2001).

In testing the effectiveness of the bitless bridle designed by Cook against a traditional bitted bridle, organised and clear examinations involving a variety of horses will be conducted over a number of weeks. These tests must be conducted using controlled equipment, riders, workouts and routines for such events as catching, saddling and riding. Through careful organisation of how these examinations will be carried out, clear observations regarding various facets of equitation should be evident and will be recorded and analysed in detail.

The use of a Polar heart rate monitor designed particularly for equine use will be incorporated to assess any physiological differences or responses. This will enable another point of measurement to monitor how each horse copes and adapts to the bitless bridle during controlled saddling and riding routines.

The prime form of communication between the rider and the horse during riding activities is through the reins (Clayton et. al. 2005). Through different

levels of understanding and levels of riding ability (Clayton et. al. 2005) the perceived rein pressure exerted by each rider can vary greatly, demonstrated in previous research results obtained by Clayton et. al. (2003). The measuring of the intensity of rein tension is one representation that the principles of 'lightness' (supple and unhindered gaits) during modern equitation may not be widespread (Ödberg et. al. 2005). Modern training appears to be based more often on force, especially in comparison to 18th century classical ideology and this has been seen to initiate welfare problems (Ödberg et. al. 2005). By quantifying the tension in the reins when horses are being ridden is a relevant and objective way to assess this welfare issue (Ödberg et. al. 2005).
Such measurements for specific movements in equitation have been recorded in previous research by Warren-Smith et. al. (2006) using reins loaded with cells that could gauge the exact amount of tension applied when riding and long-reining (Warren-Smith et. al. 2006). The rein tension has also been shown to vary between horse breed, sex and even colour by Warren-Smith et. al. (2006).

Therefore, the aim of this project will be to measure and evaluate the possible behavioural and physiological differences in horses ridden using traditional bitted bridles as opposed to Cook's 'Bitless Bridle'. The measurements will include heart rates, rein tension, and behavioural observations with particular reference to the symptoms of headshaking in one horse and the affect of Cook's suggestion of removing the bit as a potential solution to this problem.

Materials and Methods

Heart Rate

The use of this monitor will be effective in measuring the heart rate of each horse in the weeks leading up to the introduction of the bitless bridle by recording the horses 'normal' range when applying the usual and familiar bitted bridle. When the bitless bridle is introduced to each horse as the only new stimulus in its environment, the Polar monitor will once again be used to record any differences in heart rate due to such occurrences as increased anxiety or relaxation.

Rein Tension

The amount of pressure or tension exerted on the reins when riding in 'Bitless Bridle' and the bitted bridle will be measured to form the third section of the research project. The same cells used in previous research by Warren-Smith et. al. (2006) will be integrated into the reins of both the bitted bridle and 'Bitless Bridle' for the purpose of determining if the latter method requires different rein pressure to be applied to elicit the same movement in a bitted version as Cook and other 'Bitless Bridle' users perceive.

Equipment

The bitted bridles that will be used in the examination will be those that each horse has been previously and normally worked in. This is to maximise the possibility of observing differences, as riding each horse in the usual bitted bridle will exhibit normal responses for each individual. The 'Bitless Bridle' to be used on all horses is a brown 'Beta' version designed by Cook and supplied in kind by Australian Equine Arts. The 'Bitless Bridle' is of medium size and should adjust to fit all horses involved comfortably and correctly. All other tack that will be used such as saddles, saddlecloths, boots etc will be of the usual working and riding nature for each horse and at the discretion of the rider. Horses number one through to four will be performing their trial in a sixty-by-twenty metre dressage arena to be marked out and assembled complete with letters to assist riders in the test as required.

As well as equipment for horse and rider, video recording equipment will also be used to film the routines of each horse. This will be a supplementary aid for the observation of performance and behaviour, which allows also for the rider of each horse to also observe and comment on the routine and any possible differences after the event.

Horses

There are to be five horses involved in this project. As follows, each horse has been assigned a number and stated are his or her brief statistics:

Horse One: Sixteen-year-old bay gelding, Thoroughbred

Horse Two: Nine-year-old grey mare, Andalusian

Horse Three: Seven-year-old grey gelding, Anglo-Arabian

Horse Four: Twenty-four-year-old grey mare, Connemara
Horse Five: Nineteen-year-old chestnut mare, Arabian x Quarter Horse. Possible headshaker and will be closely observed for any differences between both bridles in particular relation to this condition.
Horse Six: Thoroughbred mare, age to be confirmed

Riding Routine

The use of a standardised exercise routine for each horse to undergo in both the bitted and 'Bitless Bridle' will increase the likelihood of observing visible results. For horse numbers one through to four, the Preliminary 1.2 dressage test designed by the Equestrian Federation of Australia (2004) will represent this routine as it is simple enough to be learnt and practiced by each rider involved, yet shows a number of movements and gaits on which observations will be focused upon. Each horse will perform the test three times in a bitted bridle and three times in 'Bitless Bridle'.
For horse number five, however, the preliminary test will not be used, as this mare has not completed any dressage training and is ridden primarily as a pleasure and property work horse. The riding routine for horse number five will take place on-farm in Kangaroo Valley and will consist of the following: Three laps of 'Paddock One' (two at walk, ½ at trot, ½ at canter), Trail ride for one hour accompanied by another horse incorporating some cattle work and a cross-country jump. This routine will be completed three times in a bitted bridle and three times in 'Bitless Bridle'.

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