

# Multimodal human-horse interaction in therapy and leisure riding

**Nataliya Berbyuk  
Lindström, PhD  
Senior Lecturer**

**Jens Allwood,  
Professor**

**Margareta Håkanson,  
Med. Lic.**

**Anna Lundberg, PhD,  
Senior Lecturer**

SCCIIIL Interdisciplinary Center  
Department of Applied IT  
University of Gothenburg, Sweden

Department of Veteri-  
narian Medicine and  
Domestic Animal Sci-  
ence  
Swedish University of  
Agricultural Sciences

ber-  
linds@chalmers.  
se

jens@chalm  
ers.se

Margare-  
ta.hakanson@comh  
em.se

an-  
na.lundberg@slu.  
se

## Abstract

Horseback-riding in general, and equine-assisted therapy in particular, are widely used for leisure and rehabilitation purposes. However, few scientific studies on human-horse interaction are available. The aim of this article is to provide a description and analysis of multimodal human-horse interaction in riding sessions. Video and audio-recordings of riding sessions, interviews with the riders and observations were done in a small riding school in Western Sweden. A combination of linguistic and ethological methods is used for data analysis. The recordings are transcribed, and the sequences when human-horse interactions occur are analyzed using activity-based communication analysis and ethograms. The following typical sub-activities of riding session are distinguished and considered: “greeting horse”, “care of horse before riding”, “tacking”, “mounting horse”, “waiting for co-riders”, “riding lesson”, “dis-mounting horse”, “care of horse after riding” and “saying goodbye to horse.” The analysis shows that the riders use vocal verbal, visual and tactile signals when they communicate with the horses. The riders tend to communicate more verbally while caring before the ride compared to after the riding lesson. The horses’ reactions are complex, comprising tactile (e.g. touch with the muzzle), visual (e.g. lifting legs, moving in the box/stable, ear and head movements, movements of the tail, etc.) as well as auditory ones, (e.g. snorting).

## 1 Introduction

The relationship between humans and horses has a long history. Historically, horses were kept for meat and used for transportation (Brown and Anthony, 1998; Anthony and Brown, 2000; Levine, 2005), while today they are used for leisure, sport, as working companions in rural areas and for equine-assisted interventions (for therapy and learning).

Contacts between humans and horses are not unproblematic; accidents occur among both professional riders and laymen. Research shows that the occurrence of accidents depends more on the frequency and amount of interactions between humans and horses than on the level of riding competency (Hauseberger et al 2008). Thus, a better understanding of the human-horse relationship in general, and their interaction in particular is needed to enhance safety and quality in human-horse contacts.

At this moment, little research is available on human-horse interaction in general, and even less with a focus on human communication is particular. In this article, we provide a step toward a better

understanding by an analysis of aspects of the multimodal human interaction with horses in riding sessions used for both therapy and leisure riding.

## 2 Background

A few studies, though no linguistic studies, on human-horse interaction are available. The majority of them are in the field of ethology and focus on horse behavior (Hausberger et al, 2008) as well as in the health sciences (Keaveney, 2008), biological sciences, agriculture (Birke et al, 2011), and sport sciences (Münz et al, 2014) to mention a few.

Human-horse interaction is complex. The reactions of horses to humans are mostly the result of interplay between the temperament of the horses, the temperament and skills of the humans and the experience of the horses acquired with humans. This means that such factors as the personality of horses and humans, the horses' positive/negative experiences in interaction with humans, e.g. being mistreated, are important.

Human-horse interaction is multimodal, which means that at least two of the sensory modalities (vision, hearing, touch, smell and taste) are involved. Visual and tactile communication is central. A study performed on emotional cues shows that when people have negative feelings towards animals, while stroking a horse, they induce an increase of heart rate in the horse in the first few minutes. "Neutral" or "positive" persons do not have such an influence (Hama et al., 1996). Chamove et al. (2002), who performed a study on the effect of human attitude on horse behaviour, suggested that human attitude correlates with the horse behavior when led through a predefined course. Below we will now consider some studies reporting on communication with horses using different sensory modalities.

Seaman et al. (2002) did not find an influence of the direction of gaze of the human on the reactions of horses; there was no difference between a person approaching with or without visual contact. Similarly, Verril et al (2008) studied whether having direct eye contact or avoiding eye contact with horses influenced how easily they were captured in the pastures. No differences between these behaviors were found.

Testing cross-modal recognition of horses, Sankey et al (2010) conclude that a horse's recognition of humans is based on a multimodal combination of vocal and visual identification, suggesting that horses have a "concept of person".

Concerning touch, Hausberger et al. (2008) point out that gentling (being patted or stroked) is not necessarily rewarding for animals, but that instead positive reinforcement using food has been shown to be connected with a positive association for many animals including horses. These findings raise questions concerning whether patting horses is relevant and whether it can even be contra productive when intending to give positive feedback.

Hausberger et al (2008) suggest that by training people to observe the body postures of horses, be attentive to their signals and attitudes as well as to avoid anthropomorphic interpretation of behavior, horse-human interactions will be safer and accidents due to misunderstandings can be avoided.

Continuing to the auditory communication of horses, familiar horses in the herd were paired with the "wrong" sound when the horse was out of sight. The other horses reacted when a mismatch was at hand. The researchers' conclusion was that horses recognize known individuals by auditory, visual and olfactory information (Proops 2010).

Also, human communicative behaviour towards horses in equine assisted intervention has been studied with a focus on whether horses respond to the non-vocal expressions such as body posture, movements and orientation of humans. The understanding of the communicative aspects of human non-vocal behavior was based on psychological/psychoanalytical theories (Zink 2008). Garcia (2010) mentions the ability of horses to respond to human behavior as the core reason for the therapeutic use of horses in treating humans with mental disorders. In order to understand the communication between horses and humans it is essential to expand our understanding of the signaling mechanisms of horses, she claims. Working with horses enhances the ability of humans to use their body as a sensing mechanism which appears to go beyond learning to grasp body language, toward developing more intuitive levels of awareness and environmental scanning skills. Garcia asks for more research addressing "how humans and horses communicate and how they learn with/ from each other" (ibid).

With the exception of the studies mentioned above, we have found no research, which describes and analyzes a multimodal combination of verbal and non-verbal tactile, visual and auditory communica-

tion in human – horse interaction from the human perspective. This study is a contribution to filling this gap. In addition, we try to make a contribution to developing methods for studying human interaction with horses.

### 3 Method

The data has been collected within an interdisciplinary research project, “Ethnicity and human-horse interaction”, financed by Region West Sweden (Västra Götalandsregionen) in 2010-2014. The study focuses on communication between humans and horses during a riding session.

All data were collected in a small riding school situated in a rural area close to Gothenburg, Sweden. The riding school aims at riders with and without functional disabilities and provides riding sessions for both treatment and leisure. The context of communication between humans and horses has been stable over time as most of the staff at the riding school has been permanent for several years, as have most of the riders and therapists involved in the activity. A riding session as a social activity in the school comprises the following sub-activities: “greeting horse”, “care of horse before riding”, “tacking”, “mounting horse”, “waiting for co-riders,” “riding lesson”, “dismounting horse”, “care of horse after riding” and “saying goodbye to horse.”

#### 3.1 Data collection and participants

The data comprises video and audio-recordings of riding sessions, interviews with the riders and observations of other interactions between humans and horses.

Seven (7) participants, all female, age range 11-20 y.o.a, one with paralysis, 5 native Swedes and two 2<sup>nd</sup> generation immigrants (Danish and Russian) were video- and audio recorded during their riding sessions. Total recording time is 120 minutes.

Seven audio recordings (480 min) cover a total time spent with the horse, while video recordings cover all activities but the sub-activity “riding lesson”, due to technical difficulties in getting video recordings here. Instead, the riders were observed. Their horses were 8-24 years old, 3 geldings and 4 mares, and the riders had previous experience from riding these horses.

Interviews with three of the informants regarding their views on their communication with the horses were carried out.

Forty hours of observations in the school were documented using field notes.–

#### 3.2 Data analysis

In the project, we use a combination of linguistic and ethological methods for data collection and analysis. Activity-based communication analysis (Allwood 2000, Berbyuk-Lindström 2008) was used to analyze the communication in a riding session as a social activity.

The video and audio recordings were transcribed using Gothenburg Transcription Standard. The transcription conventions are presented below:

Symbol	Explanation
R, H, A	participants (e.g. rider, horse, assistant)
[ ]	overlap brackets; numbers used to indicate the overlapped parts
( )	transcriber’s uncertain interpretation of what is being said, e.g. (jobbi)
/, //, ///	a short, intermediate and a long pause respectively
+	incomplete word, a pause within word
CAPITALS	contrastive stress
:	lengthening
<>, @ <>	comments about non-verbal behavior, comment on standard orthography, intonation, other actions, clarifications

Table 1. Transcription conventions

Visual, tactile and auditory (often verbal) communication between the riders and horses is analyzed in relation to the sub-activity in which the communication occurs. The MUMIN coding scheme (Allwood, J. et al. (2007)) is used to analyze the data. Adapted ethograms from McGreevy (2012), see appendix, are used for analyzing the behavior of horses. For the horses, the neck, head and ear position,

tail movements, posture, feet position and movements towards and from the humans as well as sounds were coded. Direction of gaze and eye contact and the responses from the horse to tactile and auditory signals were also recorded. Horse movements were not always easy to observe. However, all codings were checked by another coder. Unfortunately, time has not allowed for a more formal reliability control.

From the interviews, the comments of the riders concerning their communication with the horses are analyzed and can be combined with the analysis of the recordings. However, in this paper, our analysis is based on an analysis of the video recordings, we hope to return to the interviews in a later paper.

Notes from the observations are used to provide additional insights into the interactions and the settings of the riding sessions.

## 4 Ethical considerations

The study has been approved by the ethics committee of Västra Götaland, regarding both human and animal welfare. All riders in the study volunteered to participate. They were given information, in written and oral form, and signed a consent form. For those under fifteen years of age, consent by parents has been given as well. The horses were recorded in a riding school, in their normal environment. No invasive methods have been used. When possible, the researchers were not present during recordings in order not to disturb the activities.

## 5 Results

First, an overview of the sub-activities of a riding session is provided, followed by general comments about communication based on the interviews. Next, an analysis of communication in each sub-activity is provided. Finally, a general summary that presents an overall picture of communication in the riding sessions is provided.

### 5.1 Analysis of the riding session as a social activity

The **purpose** of the riders to come to the school is riding itself as well as contact and caring for the horses (depending on the physical ability of the riders). In leisure riding, the riders' **goal** is primarily to improve riding skills and to have fun. In the case of therapy, enhancing physical, emotional and social well being is central. Leisure riding and therapy goals often overlap.

The people present during riding sessions include riders, groom/assistants, riding instructors/therapists, fellow riders, and accompanying persons. The horse is selected and placed in the box/tie stall in advance. The name of the rider and the paired horse is on a list on the wall. The rider is expected to check which horse to take; in the case of a disabled rider, the riding instructors/therapists do this.

A typical riding session starts with the riders coming to the stables and greeting the horses they will ride (sub-activity "greeting horse"). In case of leisure riding, they start by caring for the horse, which includes brushing and cleaning the hoofs ("care of horse before riding"), which is followed by the subactivity "tacking".

When ready, the riders leave the stable and go to the mounting block, where they mount the horses with/without help from the staff ("mounting horse"). In therapy, only some of the disabled riders can (partially) carry out the care; if they are not able to do this, they go directly to the mounting block and get help with mounting. When all riders are mounted ("waiting for the co-riders to mount"), the instructor gives a signal and all involved leave for the riding lesson, which is conducted in the arena or in the nearest wood to the track. The riding lasts for 30 - 45 min (sub-activity "riding lesson").

After the lesson, all return to the yard and wait on horsebacks till dismounting is allowed ("waiting for the co-riders to dismount"). Dismounted (with/without assistance) and on ground, they (or assistants) loose the girth and the stirrups are placed in a secure position ("dismounting horse"). The rider approaches the horse and pats it, sometimes also gives it a carrot or piece of bread as a thank you and farewell sign. On a signal from the instructor, the horse is led from the yard into the stable by the riders or assistants. The disabled riders usually thank the horse and say goodbye to everyone before the horse is led to the stable. The healthy (and some disabled) riders usually put a halter around the horses' neck, remove the bridle and the saddle. The halter is properly put on the head and the horses' body

is brushed, the feet are cleaned, the bit is rinsed and the tack is removed (“care of horse after riding”). After saying goodbye the horse is left in the box/tie stall and the riders leave the premises (sub activity “saying goodbye to horse”).

## 5.2 Communication in riding session

### General comments about communication from the interviews and observations

In the interviews, the riders commented that their relationships are different with different horses; in some cases the riders experience that their personalities match (“we are soul mates” who “understand each other”), in other they don’t. Our observations indicate that riders who were fond of their horses tended to communicate more with them compared to other riders.

In general, positive feelings by the riders are experienced when coming to the stables (“a wave of joy and happiness”), and the horses are believed to be sensitive to such riders when they come to the stable. Further, the riders’ personalities and the nature of a disability influence how much the riders can communicate with the horses. The staff in the riding school often encourages the riders to communicate with the horses, e.g. asking the rider to thank the horses for the riding lesson.

In the stable, many people are present and there is hardly any privacy between rider and horse. The most private time with the horse is during caring before and after riding, and this is the time when most communication is reported and observed to occur. Below we will now exemplify and discuss communication with the horses from the point of view of the rider. We will describe what communicative acts occur both functionally and behaviorally. We will also exemplify how the joint activities of riders and humans influence the kind of communication that occurs. In future work we hope to examine the same interactions from the communicative point of view of the horse.

### Greeting a horse – a combination of tactile and auditory signals

A common strategy when greeting the horse is using one or more clicking sounds to attract horse’s attention, which is followed by “hej” (hello)/”heej” (heello), often in combination with the horses’ names or nicknames, e.g. “Carat, fröken” (Carat, miss), “gumman” (baby), “stumpan” (honey, baby), “fröken skiten” (miss muddy). Vocal ( often verbal) greetings are often combined with patting the horse’s neck, kissing the horse (often on the muzzle, throat and neck) and stroking the mane. In addition, some riders enquire how their horses feel, e.g. “älskling, hur är det?” (honey, how are you?). Other riders are observed (or report) to just pat their horses on the back and hindquarters. In the example below, the greeting activity is presented. In other words, there are considerable degrees of freedom for how to accomplish the greeting and no really narrow script can be observed.

The horse stands and rests on a back leg with his head turned towards the door of the box	
\$H7:	Changes rest leg
The rider enters the box and stands in front of the horse looking at him	
\$R7:	< Hej hästen > < Hello horse >
\$H7:	H7 stands still
\$R7:	< Ariel > < Ariel >
@ < horse’s name >	
\$H7:	stands still
\$R7:	The rider goes out of the box

#### Example 1. R7 - Rider 7, H7– Horse 7

In the example above, the rider greets the horse prior to entering the box/tie stall, saying “hello horse” and mentioning the name of the horse. Seemingly, the horse doesn’t react to the greeting.

### Care of horse before riding

The care of a horse consists of brushing and cleaning the hoofs. Communicative acts observed in this sub-activity are the following ones:

- **giving orders to horses**, e.g. moving to another side of the box/tie stall to give space for the rider to brush, to stand still, to lift the hoofs, etc.
- **expressing approval/disapproval to horses and gratefulness**, e.g. when the horses stand still and allow the riders to brush them, follow their orders or not
- **riders commenting their actions to the horses**, e.g. starting/finishing brushing or cleaning the hoofs
- **riders commenting on the horses appearance and giving compliments**, e.g. being dirty
- **more or less unconscious patting/stroking the horse**

**Instructions to the horse:** To manage brushing and cleaning the hoofs, the riders need to move around the horse in the box/tie stall. They need to instruct the horse, to move to one or another side of the box. A common way of doing this is to come from behind using clicking sounds to draw horse's attention in combination with pushing the horse with the force of the whole body, with a hand or with finger(s) on the croup, hindquarters, buttock or thigh:

R4 finished brushing the left side and the tail of H4. Coming from behind, she wants to start brushing the right side of H4. She asks H4 to move to the left, to give her space.	
\$R4	< Clicking sound twice >
< coming from behind, right hand stretching towards H4's back >	
\$H4	Neck up, ears up, head turned to the left
\$R4	< clicking sound twice >
@ < slightly pushing the H4's buttock, approaching to H4's head from the right >	
\$H4	Moving left
@R4:	< clicking sound >
< pushing H4's shoulder with her bent right hand finder >	
\$H4	Moving to the left and backwards
\$R4	Slightly patting H4's nose and start brushing H4's head

**Example 2. R4 - Rider 4, H4 – Horse 4**

In the example above, the horse reacts and moves to the left which gives space to the rider to brush the horse.

Other examples include asking the horse to stand still e.g. “ska du vara snäll idag” (will you be nice today), “Carat – ta det försiktigt – bra” (Carat be careful good).

**Expressing approval/disapproval and gratefulness:** The riders sometimes express approval, e.g. (“bra Carat bra det var inte farligt” (good Carat it was not dangerous), “bra” (good) in combination with stroking and patting the horses one or more times, often on the relevant part of the body, e.g. legs if the rider asked the horse to lift them. Disapproval is expressed by using “nej” (no) one or more times in a raised voice, often in combination with the nickname, e.g. “nej Carat” (no Carat) when the horse disobeys. Pushing the horse from oneself can also be observed. Dissatisfaction with the horse's behaviour is expressed, e.g. “O jä...va du skvätter ner dig fröken” (oh damn you splash yourself miss ). The riders also express gratefulness if the horse is obedient (e.g. “SÅ – tack så mycket – nästan” (SO thank you so much almost). They also ask if the horse likes cleaning, e.g. “Är det skönt” (is it nice). Patting the horse is common.

**Commenting their actions:** The riders tend to comment on their actions. Clicking sounds are often used to draw attention to new actions, followed by a question to the horse, e.g. “Kan vi tränsa nu?” (can we bridle now), “Ska vi ta hovarna fröken? Ska vi ta hovarna” (Shall we take the hooves miss? Shall we take the hooves), “O nu skall vi borsta dig” (oh now we will brush you). Finally, when they finish the action, they pat the horse to signal this and that the horse has behaved well.

The riders also **comment on the appearance of the horses and give compliments**, e.g. “Du e söt”, “du e fin”, “å va du e gosig”, “du är så duktig” (you are so sweet, you are so nice, oh you are so cuddly, you are so clever) in combination with smacking sounds.

**More or less unconscious patting/stroking** the horse is common in this sub-activity. While brushing, the riders use one hand, another lying on the horse's side. Often the riders more or less unconsciously pat and stroke the horse.

### **Tacking**

While tacking (taking off the halter from the horse's head and putting the halter around the horse's neck), putting on the bridle and the saddle, less auditory communication is observed. It is worth mentioning that while tacking, the horse's head is close, which results in the riders patting, stroking and kissing the horse's face, poll, mane and nose.

### **Mounting the horse and waiting for co-riders to mount**

While mounting, the assistants often help the riders. Here, both riders and other people tend to communicate with the horses. The riders ask their horses to come closer ("kom" (come)), in combination with smacking, clicking and whistling. They show **disapproval** when the horse doesn't stand still, which makes it difficult to mount ("Ja men DU!" (well but YOU)) and **disappointment** (Ahh FRÖKEN (oh MISS)).

Some auditory communication with the horse is observed while waiting. Stroking the horse's mane and neck, is common. Asking him/her to stand also occurs ("Duktig fröken, duktigt, Vi ska inte gå ut än fröken," "Nu skall vi snart gå fröken", "Ta det lugnt gumman" (clever miss, clever, we will not go yet, now we will soon go, take it easy)). Both louder voice and whispering, e.g. "sluta" (stop whispering) and stop ("Proo") are used.

### **Riding lesson**

The sub-activity the "riding lesson" for riders is divided into transport to the riding hall, the lesson itself (warm up time, riding tasks and cool down time) and transport back to the yard. During the transport and warm up/cool down, rider and horse mostly communicate in a tactile manner. The pace is walk. During the riding tasks, the riders follow the directives from the riding instructor and are focused on accomplishing the tasks in trot and in canter. The physical level of activity is high. Since the riders are supposed to make their horses follow what the instructor says, clicking sounds, pressing the legs to horse's sides and body balancing are used as means to do this.

When the lesson is finished, the riders are often physically tired. Some riders are humming and patting/stroking the horses to thank them for the ride. Others are quiet. The horses with the riders walk to the mounting area one after another.

### **Dismounting the horse**

Dismounting starts when all riders are safely positioned in the yard and their horses are standing still. The riders hug or pat the horse on the shoulder or neck, then dismount with or without help. Especially when riders have disabilities the instructors ask the riders to thank the horses and pat them. Often the horses get carrots or apples. When the rider stands on the ground, the horse turns its head towards the rider and sniffs. The human loosens the girth and places the stirrups on the top of the leathers, first on one side, then on the other walking around the horse's front. When the equipment is adjusted, the horse is led into the stable.

### **Care of the horse after riding**

After riding, care of the horse is done primarily by those riders, who can manage it physically. Being led into the stall/box, the horse is being untacked, halter is put on and tied to a lead-rein by an instructor or the rider. The horse's back and stomach (where the saddle was put) are brushed. If the horse is sweaty, it is cooled down with water from a sponge. The legs are controlled for wounds and the hoofs are checked for stones and dirt to be removed.

When the horse is checked out the lead-rein is hooked off and the horse is left to rest in its tie stall/box. Not much auditory communication can be observed during this sub-activity. Often riders are tired. Similar patterns, as in brushing before the riding lesson, can be observed in care of the horse after riding.

In the example below, the communication between the horse and the rider can be observed:

\$R7:	begins brushing right hind leg
\$H7:	the horse moves a bit
\$R7:	< Ähh sluta > < <i>Ahh stop</i> >
@ < irritated >	
\$R7:	proceeds brushing right hind leg
\$H7:	H7 lifts the right hind leg three times
\$R7:	The rider stands up and sighs. Brushes bit on the back and then goes over to the other side and brush where, towards the back hind leg.
\$H7:	H7 takes a step to the right
\$R7:	< Nää > < <i>neeh</i> >
@ < irritated >	
\$R7:	The rider stands up, walks up to the head of the horse and starts brushing the left side

**Example 3.** R7 - Rider 7, H7 – Horse 7

In example 3 above, the horse shows disobedience and doesn't follow the rider's requests which results in irritation.

### Saying goodbye to the horse

The rider says goodbye by using a combination of vocal verbal and tactile signals by a pat on head, shoulder or bottom. Usually, riders are in a hurry to go home, they talk to their co-riders and can be observed to show less interest in their horses.

## 6 Discussion and conclusions

Our study is qualitative and it is based on a limited amount of data. Thus, conclusions have to be tentative. In general, the study shows that communication between humans and horses is complex and has different features in different stages of the riding session in terms of the communicative means used, their functions and intensity. Human-horse communication is multimodal, comprising both bodily and verbal communication. The riders tend to use verbal greetings, without or in combination with the names (nicknames) of the horses to greet their horses, sometimes even asking how the horses feel, which resembles human-human greetings. A different way of greeting is tactile by patting the horse on the back and hindquarters, which resembles humans patting an interlocutor's shoulder. A possible reason for choosing patting rather than talking can be that the riders approach the horses from behind, and patting the horse might be more natural as a better attention-getting strategy as many people are present in the stables, it can be quite noisy, and the horse might not pay attention to the greeting (in the way a human would in the same situation).

Most of the auditory and tactile communication between riders and horses occurs while taking care of horses before riding which includes brushing the horse and cleaning the hoofs. A possible reason for this can be that in this sub-activity the rider and the horse are on the same level (both standing on the floor), which makes this kind of communication possible. In addition, it is the most private part of the riding session, as no other people are usually involved. Further, the fact that the riders often get different horses for each session might necessitate a need and desire for creating a relationship with the horse. Another factor is that the riders are anticipating the riding session and are willing to make contacts with horses.

While caring for horses before riding, the riders are carrying out certain tasks, such as brushing the horses' body and cleaning the hoofs, which necessitates using instructions to the horses to move to give space, to lift legs or to stand still. Clicking sounds, patting and pushing the horse are used, often resulting in the horse doing what the riders want (Example 2) or not (Example 3). It can be observed that the clicking sounds are used to attract attention, while touch (pushing and patting) give a more specific and a stronger signal to horses, e.g. patting on the leg is a signal to lift the leg, etc. In the data (Example 2), we can observe the reactions of a horse to the rider's actions and, compared to Example 1, a reaction from the horse can be observed. Possibly, the horses react more strongly to tactile contact than they do to only vocal cues.



An interesting type of behavior is that the riders are commenting their actions to the horses and asking for permission to brush or pick up hooves. Similar patterns can be observed in e.g. medical consultations and child-parent interactions, when physicians/parents comment their actions to patients/children in order for them to be calm, prepared to and informed about what is going on. It probably reflects a somewhat superior and caring attitude to the horses from the riders' side, which is even present in the riders' expressing approval/disapproval and commenting on appearance/giving compliments. Smacking sounds are used, which is a way to show affection.

More or less unconscious patting/stroking of the horse is also common in this sub-activity. While brushing, the riders use one hand, another lying on the horse's side. Often the riders more or less unconsciously pat and stroke the horse. It is unclear if the riders are attempting to calm the horse down or just are automatically leaning on the horse.

Proximity to the horse's head is closest while tacking, which makes it possible for the riders to touch the head and, as can be observed from the data, to pat, stroke and kiss the horses' face, poll, mane and nose.

Presence of other people seems to influence the frequency and intensity of communication between the riders and their horses. Communication can be observed while mounting and dismounting the horse and during the riding itself. While mounting/dismounting, instructions given by the riders to the horses to stand still/come close can be observed. While waiting for the lesson, the riders mainly try to calm the horses down. Verbal cues and stroking the horse's mane and neck are used, which resembles a human way of calming another human being. Interesting that both whispering to horses and exclamations are used, which probably reflects a more or less caring attitude to horses and a need for more or less strict orders. After the lesson, the physically able riders get down with/without help and often just silently take their horses to the stable to brush them. It is interesting why so little auditory communication is observed after riding, probably due to the riders being tired and even a feeling of an accomplished task, which does not necessitate any further cooperation.

Little verbal communication is observed during riding, as the instructor provides the orders the riders should follow. Audio-recordings show that clicking sounds are used, probably because they can be heard by the horses, also pressing the legs can be observed. The horse is mainly seen as a tool for carrying out the tasks. In general, functional requirements concerning both the communicative acts used by the riders and the way in which the joint activities between horses and riders influence the communication leave considerable degrees of freedom for how to accomplish these functions. This means that riders show a fair amount of variation in how they communicate with their horses. No real conventional "scripts" seem to have developed, instead local circumstances play a large role for how a given function is communicated mostly using a combination of vocal sounds (often verbal) and tactile signals. As far as we have been able to see vision is less important. We have not really been able to investigate the role of smell and taste both of which no doubt also play a role.

## Acknowledgements

The authors wish to thank the riders and the staff in the riding school for participation in the project and Region West Sweden (Västra Götalandsregionen) for financing of the project

## References

- Anthony, D.W., Brown, D.R. (2000). Eneolithic horse exploitation in the Eurasian steppes: diet, ritual and riding. *Antiquity* 74, 75–86.
- Allwood, J. (2000). An activity based approach to pragmatics. In: H. Bunt & B. Black (Eds.), *Abduction, belief and context in dialogue: Studies in computational pragmatics* (pp. 47-80). Amsterdam: John Benjamins.
- Allwood, J., Allwood, J., Cerrato, L., Jokinen, K., Navarretta, C. & Paggio, P. (2007). The MUMIN coding scheme for the annotation of feedback, turn management and sequencing phenomena. *Language Resources and Evaluation*, 41(3-4), 273-287.

- Berbyuk Lindström, N. (2008). *Intercultural communication in health care. Non-Swedish physicians in Sweden*. Gothenburg: Department of Linguistics, University of Gothenburg.
- Birke, L., Hockenhull, J., Creighton, E., Pinno, L., Mee, J., Mill, D. (2011). Horses' responses to variation in human approach. *Applied Animal Behaviour Science*, 134, 56–63.
- Brown, D.R., Anthony, D.W. (1998). Bit wear, horseback riding, and the Botai site in Kazakstan. *Journal of Archaeological Science*, 25, 331–347.
- Chamove, A. S., Crawley-Hartrick, O. J. E., Stafford, K. J. (2002). Horse reactions to human attitudes and behaviour. *Anthrozoos*, 15, 323-331.
- Garcia D. (2010). Of Equines and Humans: Toward a New Ecology. *Ecopsychology*, 2(2), 85-89.
- Hama, H., Yogo, M., Matsuyama, Y., (1996). Effects of stroking horses on both humans' and horses' heart rate responses. *Japanese. Psychology Research*, 38, 66–73.
- Hausberger, M., Roche, H., Henry, S., Visser, E. K. (2008). A review of the human–horse relationship. *Applied Animal Behaviour Science*, 109, 1-24.
- Keaveney, S. M. (2008). Equines and their human companions. *Journal of Business Research* 61, 444-454.
- Levine, M.A. (2005). Domestication and early history of the horse. In: Mills, D.M., McDonnell, S.M. (Eds.), *The Domestic Horse: The Origins, Development, and Management of Its Behaviour*. Cambridge University Press, Cambridge, pp. 5–22.
- McDonnell, S. (2003). *A practical field guide to horse behavior*. Hong Kong: Eclipse Press, Hong Kong.
- McGreevy, P. (2004). *Equine Behavior: A Guide for Veterinarians and Equine Scientists*. China: Saunders.
- McGreevy, P. (2012). *Equine Behavior: A Guide for Veterinarians and Equine Scientists*. China: Saunders.
- Münz, A., Eckardt, F., Witte, K. (2014). Horse–rider interaction in dressage riding. *Human Movement Science*, 33, 227-237.
- Proops, L., McComb, K. (2010). Attributing attention: the use of human-given cues by domestic horses (*Equus caballus*). *Animal Cognition*, 13, 197-205.
- Sankey C., Henry S., Go' recka-Bruzda, A., Richard-Yris, M.-A., Hausberger, M. (2010). The Way to a Man's Heart Is through His Stomach: What about Horses? *PLoS ONE* 5(11), e15446
- Seaman, S., Davidson, H., Waran, N. (2002). How reliable is temperament assessment in the domestic horse (*Equus caballus*)? *Applied Animal Behavior Science*, 78, 175–191.
- Verrill, S., McDonnell, S. (2008). Equal outcomes with and without human-to-horse eye contact when catching horses and ponies in an open pasture. *Journal of Equine Veterinary Science*, 28, 309-312.
- Young, T., Creighton, E., Smith, T. and Hosie C. (2012). A novel scale of behavioural indicators of stress for use with domestic horses. *Applied Animal Behavior Science*, 140, 33-43.
- Zink R. (2008). Do horses co-communicate? Inbetween the worlds of horse and human. Insights to results of behavioral research of horses expressive behavior. Proceedings from Mench unf Pferd in Dialog. EU-konferenz. Wien 2008.

## Appendix

Table 2. Description of different horse behaviours registered from the video recordings.

Adapted from McDonnell (2003), McGreevy (2004) and Young *et al.* (2012).

Name	Description
Alert	Horse stands with neck elevated and eye level elevated above height of withers
Relaxed	Horse stands with head and eye level lowered under the wither, often with one back hoof lifted and weight distributed among only three legs
Yawn	Deep long inhalation with mouth widely open and jaws either directly opposed or moved from side to side
Approaches	Horse takes one or more steps towards human
Backs of	Horse takes one or more steps away from human
Attention toward	Head and/or ears directing towards human
Attention away	Head or/and ears directed away from human
Push	Pressing of the head, neck, shoulder chest, body or rump against the human, equipment or interior design
Tail swish	Tail is flicked to one side and/or the other of the quarters
Ears flat	Ears pressed caudally against head and neck
Bite threat	Neck is stretched and ears are pinned back, the jaws are opened and closed rapidly as the head swings towards, without biting, the target
Kick threat	One or both hindlegs are lifted slightly off the ground without subsequent backward extension
Bite	Ears pinned, lips retracted and jaws are opened and rapidly closed with teeth grasping clothes or skin/flesh of human
Kick	One or both hindlegs lift off the ground and rapidly extend backwards
Eating from ground	Horse is foraging with the head lowered at the ground
Eating from hay net	Horse is foraging from the hay net
Eating from hand	Horse takes food item with the muzzle from the human hand, chews and swallows
Drinking	Horse immerse lips in the water bowl
Exploratory	Lick, sniff or touch with muzzle or tongue
Pawing	Strikes a vertical or horizontal surface, or the air, with a front leg
Defecation/urination	Elimination of faeces and urine
Lifting hoof	Horse lifts hoof of the ground as the human touches that leg with the hand and/or shoulder
Follows	Horse walks forwards in a four beat gait after or beside the human when led in the reins