A pilot study on yearlings' reactions to handling in relation to the training method

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Abstract

Handling and training methods of horses, which specially emphasize the importance of understanding horse body language and the use of reinforcements ,are often used in practice, yet their effects are not completely known. This study investigated whether the use of a sympathetic approach during the preparation for public auctions influenced the reactivity of young horses towards humans. Sixteen thoroughbred yearlings were prepared for the public auctions during one month: eight horses ("Control") were handled according to conventional practices, while the others ("Treated") were handled with two sessions of basic training based on body language. The reactivity of horses was assessed in the presence of an "unfamiliar person" and a "familiar person" inside the horse's box. The experimenter recorded the presence/absence of selected behaviors during seven observational moments: "approaching the box", "opening the box door", "entering the box" and four consecutive observations every thirty seconds. Reactivity of horses was ranked during the first experience of "bit", "grooming", "shower" and application of the "surcingle". Heart rate was telemetrically recorded during this final test. At the end of the auction preparation, "Treated" horses exhibited more "contact" ($P=0.08$) and "lick" ($P<0.05$) behaviors in the presence of a person. "Control" horses showed higher (NS) percentages of negative (more nervous) rankings during "bit", "grooming" and "surcingle" tests. Two "Control" horses showed aggressive behavior during the application of the surcingle and the test was interrupted to guarantee person and animal safety. In this pilot study, horses handled with a sympathetic approach showed less reactive behaviours compared to "Control" subjects. It would be interesting to enlarge the sample size and assess if the use of a non coercive handling during the whole training period influences their welfare positively and for a long time.

Keywords: Human-horse relationship; Behavior; Training; Handling; Heart Rate.

Introduction

Many methods of horse handling are based upon traditional knowledge and do not actually consider the specific ethogram of the horse. The interest in training methods that take into account the natural behavior of the horse and avoid harsh methods has been increasing in the last few decades in developed countries. These different methods, often defined as "sympathetic horsemanship", emphasize the role of horse body language or the use of positive reinforcements (Miller 1991; Roberts 1997; Waran, McGreevy and Casey 2002). Few scientific studies have been published so far about the different training methods of horses. Shanahnan (2003) indicated that non-aversive training, based on Tellington-Touch Equine Awareness Method (TTEAM) reduces heart rate, saliva cortisol, loading time and stress during the loading of horses that are difficult to transport. McGreevy (2004) reported that training is most effective when the related practices consider specific learning abilities and the minimization of stress. An early handling is more profitable, reduces emotionality and enhances learning ability (Heird et al. 1986; Mal and McCall 1996), and reduces the prevalence of resistances and defensive aggressions (Miller 1991; Spier et al. 2004). Jezierski *et al.* (1999) reported that foals handled for 10 minutes for 5 days a week showed a lower heart rate and a better tractability during tests in comparison with non handled foals. Heavy-handed or inexperienced riders can inadvertently cause pain to the horses causing a conditioned fear response of avoidance (Casey 2002). Intensively handled foals are calmer and more tractable than untreated ones (Simpson 2002), however their learning efficiency can deteriorate if they are pushed to work too hard (Rubin, Oppergard and Hintz 1980).

Hence, it would be very important to assess objectively the effects of handling methods on horse behavior. These studies would be innovative and useful because "sympathetic" training methods that emphasize the importance of body language are increasing their popularity in horse practice. However, their consequences on horse welfare are not known.

To reach this aim, the authors investigated whether the use of a sympathetic approach during the preparation for public auctions influenced the reactivity of young horses towards humans.

Methods

This study was carried out during a two month period at the S.A.B. (Società Allevamento Besnate), one of the largest thoroughbred stud farms in Italy.

2.1. Animals and Management

Experimental subjects were 16 thoroughbred yearlings, (16-18 months old), balanced for sex, taken to the stud farm for the auction preparation. The horses, prior to reaching the training center, lived in groups in grass paddocks, interacting with humans only during feeding, monthly weighing and veterinary treatments. After reaching the training center, they were individually stabled in loose-boxes with a straw bed and a frontal sliding door. Horses were submitted to the same daily management routine, water was available *ad libitum* and they were fed hay and concentrate twice a day. The horses were randomly divided into two homogeneous groups, subsequently named "Treated" and "Control" group.

2.2. Experimental Procedures

"Control" yearlings were traditionally handled by experienced stud personnel daily to become habituated to humans. The procedure consisted in haltering, leading outdoors to the paddock, brushing, picking up their feet and receiving veterinary examinations. Each "Treated" horse received two sessions of "sympathetic training"(with an interval of a fortnight between the two) following the procedure used by Roberts (1997) and briefly summarized hereafter. Every session lasted from 15 to 45 minutes, in relation to horse reactions, and took place in an indoor 15 m circular walled pen. The experimenter (an experienced trainer) let the horse loose and encouraged it to move round with the use of body posture and a length of lunge. When the yearling showed signs of attention-like movements of the inside ear, the trainer turned his body at an angle of 45 degrees towards him and let it approach and follow, rewarding it with a gentle stroke.

2.3. Reactivity Tests

"Treated" and "Control" horses were observed during the following reactivity tests by personnel who were not aware of which treatment each animal received:

1. in the presence of either an "unfamiliar person" or a "familiar person" in their usual box ("reaction to a stationary human");

2. to the first experience of wearing a "bit", being groomed ("grooming"), being showered ("bathing") and wearing a surcingle ("surcingle");

As the yearlings underwent the behavioral tests, they were video-recorded from a hidden place so as not to interfere with their normal behaviour. The recorder's placement allowed observation of the whole body of each horse regardless of its position and avoided any interference with the tests.

- ***"Reaction to a stationary human"***

This test consisted of the direct observation of the horse's reactions to the presence of either an "unfamiliar person" (UP) or a "familiar person" (FP) in his own box. UP and FP were two women who wore blue overcoats and avoided direct eye contact during the tests. The experimenters, using an instantaneous time sampling method, recorded the presence/absence of selected behaviors at particular instants: "approaching the box", "opening the box door", "entering the box" and during four consecutive observations every 30 seconds.

The following behaviors were recorded: immobile, approaching person, sniffing person, in contact with person, licking person, nibbling person's clothes, strike threat, moving away from person, ears back, bite threat, kick threat and rear threat.

Tests were made twice, with an interval of 32 days, and at least at two hours from feeding times. The two replicates of the test are hereafter called Initial Test and Final Test. Two tests were administered during each replicate: the first was performed by UP and the second, after 8 hours, by FP.

To assess the effects of handling on the reactivity of young horses towards specific management practices, yearlings were observed during the tests described below.

- ***"Bit"***

The handler introduced a bit without bridle into the mouth of each horse in its own box. The horses were scored as "calm" when they accepted the bit without resistance or "reactive" if they lifted their heads, recoiled or were reluctant to lower their heads.

- ***"Grooming"***

The test was performed in the home boxes and consisted in 3 phases when the handler: 1. stroked with a plastic curry comb and brushed the whole body of each horse; 2. cleaned eyes, nose and muzzle with a moist cloth; 3. brushed mane and forelock. During each phase, the horses were scored as "calm" when they accepted the manipulations remaining immobile or "reactive" when they tried to flee or showed an aggressive body posture (Waring 2003).

- ***"Bathing"***

Each horse was led to the washing box. The test consisted in 4 phases: 1. wetting of the whole body; 2. shampooing with a sponge; 3. rinsing with the shower; 4. drying using a sweat scraper. Horses were scored as "calm" or "reactive" as in the previous test.

- ***"Surcingle"***

The "surcingle" test took place in an indoor round pen. Two people were necessary to perform the test. One experienced handler restrained the horse with a head collar and a lead rope and the other one fixed a surcingle and a heart rate monitor (Polar® Vantage NV). The handler: 1. moistened the horse's coat at the electrodes' position on the cardiac area and the upper left thorax; 2. placed the surcingle with the heart rate recorder.

Behavioral reactions of horses during both phases were classed as "calm" when they did not try to escape and they had facial expressions of alert wakefulness (Waring 2003) for more than 50% of the time. They were considered "reactive" when they tried to flee, rear, bite or kick, they

pawed, snorted and they had facial expressions of alarm (Waring 2003) for more than 50% of the time.

Heart rate (HR, at 5 s intervals) and heart rate variability (HRV) were telemetrically recorded and data were stored for future analysis. For each horse, recording periods without artifacts were selected (8 min for HR and 5 min for HRV). HRV gives information about the sympathetic-parasympathetic autonomic balance (Task Force of the ESC and the NASPE 1996). The following time domain parameters were calculated (Marchant-Forde, Marlin and Marchant-Forde 2004): average inter-beat interval (IBI), maximum and minimum R-R waves intervals (RRmax and RRmin), standard deviation of the R-R intervals (SD) and the root mean square of successive differences (RMSSD). Frequency domain analysis was performed and the following parameters were calculated (Marchant-Forde, Marlin and Marchant-Forde 2004): LF (0.01 – 0.07 Hz, corresponding to the sympathetic nervous system activity), HF (0.07 –0.5 Hz, corresponding to the parasympathetic autonomic nervous system activity) and LF/HF (corresponding to the modulation of the sympathetic versus vagal branches).

Two "Control" horses exhibited aggressive behavior towards the experimenters hence their tests were interrupted.

2.4. Statistical Analysis

Inter-observer reliability between experimenters was assessed by means of independent parallel coding of a random sample of videotaped tests (10%). Percentage agreement was always more than 98%. Behavioral data were statistically analyzed. Frequency and proportional duration of each behavior were calculated. Behaviors that did not occur or that were recorded only sporadically were not included in the statistical analysis. The behaviors that were included were: "Immobile" "Approaching", "Sniffing", "In Contact", "Licking Person" and "Nibbling". Data were then analyzed by means of the non-parametric analysis of variance test (Kruskal-Wallis Test) (SPSS 2003). To analyze the interaction between behavioral variables of the test, a principal

component analysis with Varimax rotation (PCA) was used. Factor scores were calculated for horses when the component's Eigen value was greater than 1 (SPSS 2003).

For the "surcingle" test, integrated behavior and HR analysis were carried out. The HR curves were visually analyzed and compared to the behavior of the horses, in order to verify if variations in HR corresponded to specific reactions of horses or environmental stimuli. HRV was calculated by means of the index method and the frequency method and the relevant data were analyzed by Wilcoxon Match Paired test.

Results

- ***"Reaction to a stationary human"***

When comparing the data from the initial and final reactivity tests a change in the behavior of the yearlings was noted after the handling period.

The results from the Principal Component Analysis (PCA) on the initial and final tests showed that three components accounted for 25.1 %, 20% and 16.5% of the variance.

The first component (PC1) is described by the variables "Immobile" (0.746), "Sniffing Person" (0.628) and "Approaching" with negative sign (-0.860). These behaviors correspond either to an exploratory attitude or to diffidence towards the experimenter. The second component (PC2) is represented by behaviors that correspond to both high negative "Moving away" (0.735) and high positive "Nibbling Clothes" (-0.786) reactivity and may indicate some form of heightened reactivity. The third component (PC3) is composed of " In Contact" (0.539) and "Licking Person" (0.706) which are both behaviors indicating a positive attitude towards humans.

In this study the difference between the yearlings before and after handling was displayed mainly on the second component (Fig. 2). Before handling, the yearlings mostly kept at a distance from the experimenter while after handling they sought contact by biting the handler's clothes.

During the initial test there were no significant differences between "Control" and "Treated" horses and during the final test "Treated" horses showed more licking behavior ($p<0.05$) in

presence of the UP (Fig. 1a), and more contact (p=0.09) and licking behavior (p=0.1) with the FP (Fig. 1b).

"Immobile" behavior was displayed mostly in the initial phase of the test and the percentage of immobile yearlings decreased progressively from 42.9% ("approaching the box") to 14,3%("entering the box"), 3.6% (1') and 0% (after 1'30'').

- "***Bit" – "Grooming"-"Bathing" Tests***

During the "Bit" test 87.5% of "Control" horses displayed highly reactive behavior as opposed to 37.5 % of the "Treated" group. Highly reactive behavior was defined by the behavior the horses displayed in an attempt to avoid the placement of the bit by backing up and lifting the head.

During all 3 phases of the "Grooming" test, "Control" horses showed more reactivity than "Treated" horses.

During the use of the "Brush – Curry-comb" 25% of "Control" horses reacted by showing avoidance behavior while none of "Treated" showed a reactive behavior. During the use of the moist cloth the "Treated" group stayed calm whereas 37.5% of the "Control" group reacted negatively. 50% of the "Control" group and 12.5% of the "Treated" group displayed reactivity while their mane-forelock was brushed.

"Control" horses showed more reactivity than the "Treated" horses during the 4 phases of "Bathing" test, particularly during the first contact with water (87.5%) and the "soap" phase (37.5%).

As for the "surcingle" test, during the "moist coat" phase 66.7% of "Control" and 25% of "Treated" showed reactivity, while during the surcingle phase 22.2% of "Control" showed reactivity as opposed to none in the "Treated" group.

Integrated analysis of HR and behavior established that noises that came from outside the round pen were mostly the cause for the variation of HR, independently from the treatment condition.

For all the horses the highest peaks of HR were correlated to human voices, dog barks, neighing of other horses and particularly to aeroplane noise (fig. 3) (the stud farm was near Malpensa

airport). The state of alertness and HR variations were noted to happen contemporaneously. Table 1 features the HRV average values and reports the comparisons between the "Treated" and "Control" groups. No significant difference was found in any of the parameters.

Discussion

The aim of this pilot study was to investigate through behavioral tests the effects of sympathetic handling on the reactivity of young horses towards humans and on their first experiences of specific manipulations.

The analysis of the horses' reactions to a stationary human showed that , particularly after the handling period , both groups exhibited behaviors related to the exploration and investigation of the person present in the box during the test by displaying the following behaviors: "Sniffing", "In Contact" and "Nibbling". Fraser (1992) reports that horses show exploratory behavior exclusively when they are not experiencing fear and apprehension. Therefore , it seems that the horses that participated in this experiment were not fearful of humans during this phase of the trial.

In "Treated" yearlings, "Licking Person" and "In Contact" occurred more often during the tests showing a higher tendency to seek contact with humans. "Nibbling Clothes" was among the most frequently exhibited behaviors and was not considered as a bite but as a sign of curiosity and exploration. Nibbling an object is one of the first play responses associated with approaching and investigating an object (McDonnel and Poulin 2002). The occurrence of this behavior can be explained by the combination of the curiosity that is typical of young horses together with the acceptance of humans during the training sessions. Licking and smelling an inanimate object is used to investigate the smell, the structure , the shape, the taste and the dimensions of the object but also precede and/or are performed at the beginning of reciprocal grooming between the individuals of a herd (McDonell and Poulin 2002).

Among the explorative behaviors, “Approaching” and “Seeking Contact” are often induced by the sight of familiar objects in an unfamiliar environment or vice versa. By exploring, the horse acquires useful and important information which results in high adaptability causing the horse to respond promptly when necessary (Fraser 1992).

In the present study , explorative behavior was displayed by both groups and more frequently in “Treated” horses. “Immobile” behavior was recorded more often in the initial phases of the test. This behavior may be interpreted as a pause before approaching the experimenter: the horse waits immobile verifying that there is no danger and starts moving only when everything is under control. In this case “Immobile” behavior could be due to the horse being accepting and relaxed in the presence of a human and not a behavior that would be displayed in a situation of extreme fear or acute stress (freezing) (Archer 1973).

In both groups ,the PCA showed an increase in the occurrence of the behaviors associated with the interactions with humans: “Approaching”, “In Contact”, “Sniffing Person” and “Nibbling Clothes”. Between the Initial and Final Tests, the horses became more curious and “relaxed” when in presence of the experimenter. Grandin (1993) reported that animals used to frequent manipulations and close contact with humans were more calm and less stressed than those who rarely saw humans. It can be hypothesized that these behaviors are associated not only to the handling but also to normal physical and behavioral development of foals that grow with exposure to human contact (Waring 2003).

“Bit”, “Grooming” and “Bathing” tests confirmed that “Control” horses showed higher percentages of reactive behaviours. These manipulations are commonly used to prepare horses for auctions and involve contact with some of the horses’ vulnerable zones, like the head and the abdomen.

The manipulations (similar to allogrooming) and the physical contact during the sessions of sympathetic training may have facilitated the application of the harness and the management

practices. “Control” horses reacted more negatively towards humans also during the first application of the girth belt which induced the experimenters to interrupt two tests.

The occurrence of noises from the outside was correlated with an HR increase, alertness, high attentiveness and stillness which are behaviors that animals show in conditions of fear or acute stress (Archer 1973). HR rose and reached a peak when the intensity of the noise was highest.

These observations are in agreement with the results reported by Stewart *et al.* (2003) from their study on air transport of horses, whereby one of the possible causes of HR increase was the vibrations made by aeroplanes.

The occurrence of the variations in HR and behavior in this case shows that the animals were not habituated to this type of acoustic stimuli. It therefore seems important to pay particular attention to this type of environmental stimuli when rearing yearlings.

There were no statistically significant results from the analysis of the data on HRV. This might have been due to high individual variability, to the limited number of horses being examined and requires further investigation with a broader sample.

Conclusions

This pilot study revealed that after having been handled for a period of time the yearlings were more sociable towards humans. The “Treated” group horses in particular showed more positive interactions with humans resulting in lower reactivity and higher compliance during specific manipulations in the preparations for the auction sales.

It would be of interest to investigate in further studies with larger animal samples if a sympathetic training has a positive influence on the behavior and reactivity of the horses when used throughout the training phase. Investigating if these horses perform better during races than horses trained with traditional methods would be of equal interest.

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Tables & Figures

Reactivity Test

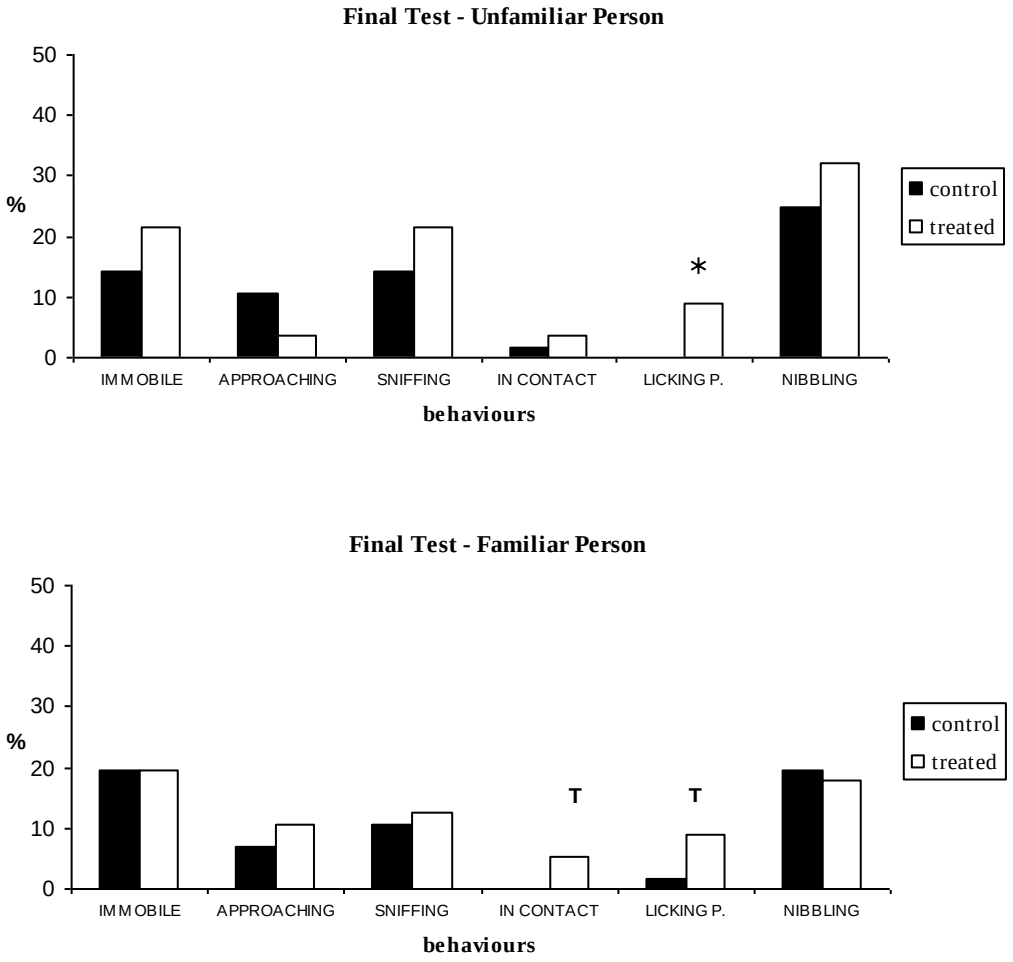

Fig 1a and 1b: Percentage of horses showing the observed behaviors. a) Unfamiliar Person. b) Familiar Person. ∗($p<0.05$), T($p<0.1$).

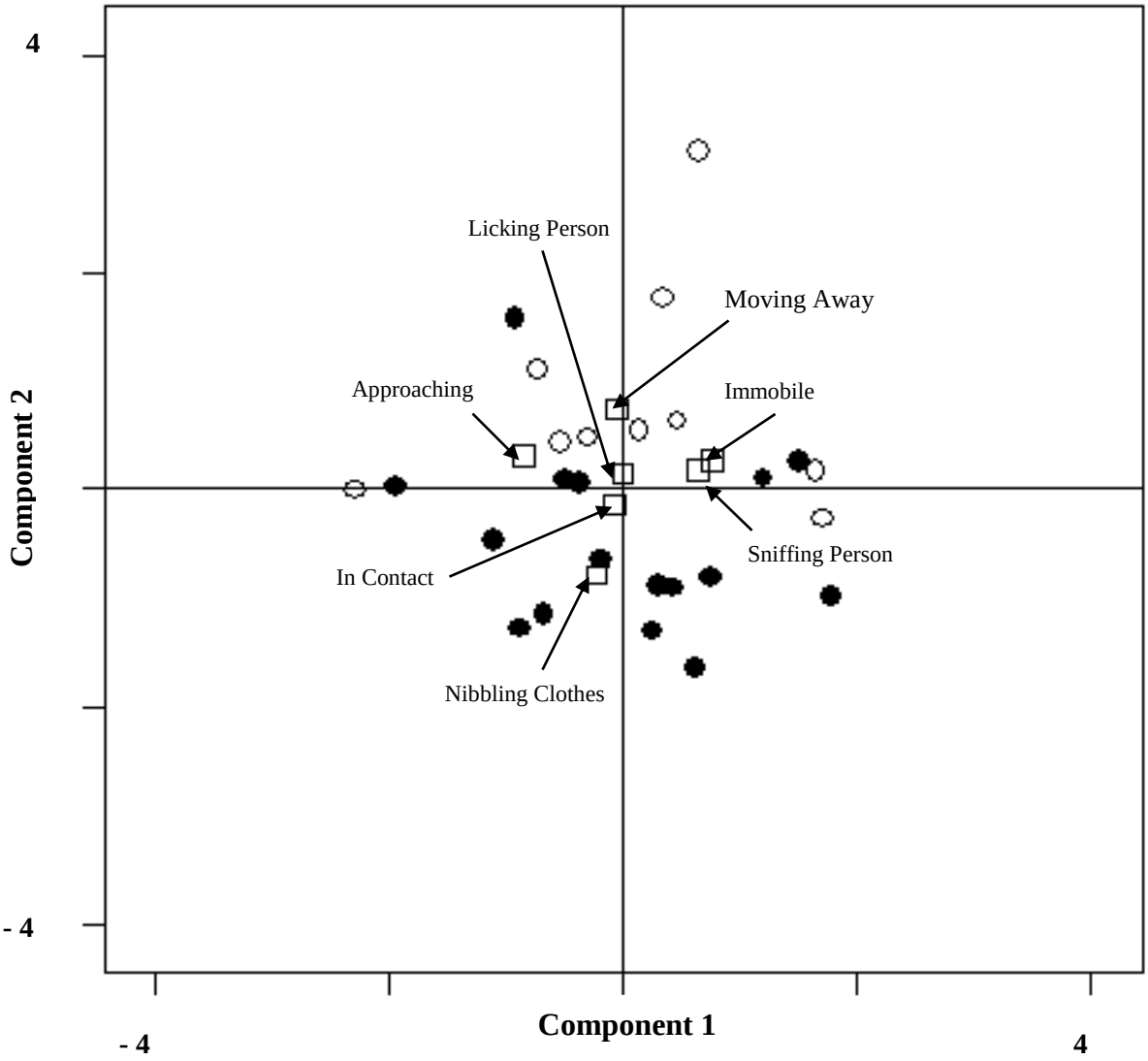

Fig 2: Projection for the loadings of the behavioral variables and yearlings' scores considered on the First and Second Principal Component. (○ yearlings before treatment - ● yearlings after treatment - □ behavioural variables)

TABLE 1: Principal Component Analysis (PCA) of behaviour

Behaviour	PC1	PC2	PC3
Standing immobile	**0.746**	0.259	-0.272
Approaching person	**-0.860**	0.318	0.109
Sniffing person	**0.628**	0.191	0.134
In contact with person	-0.084	-0.128	**0.539**
Licking Person	-0.010	0.143	**0.706**
Nibbling person's clothes	-0.241	**-0.786**	-0.324
Moving away from person	-0.063	**0.735**	-0.395

[1] The most significant behaviours for each component are bold typed

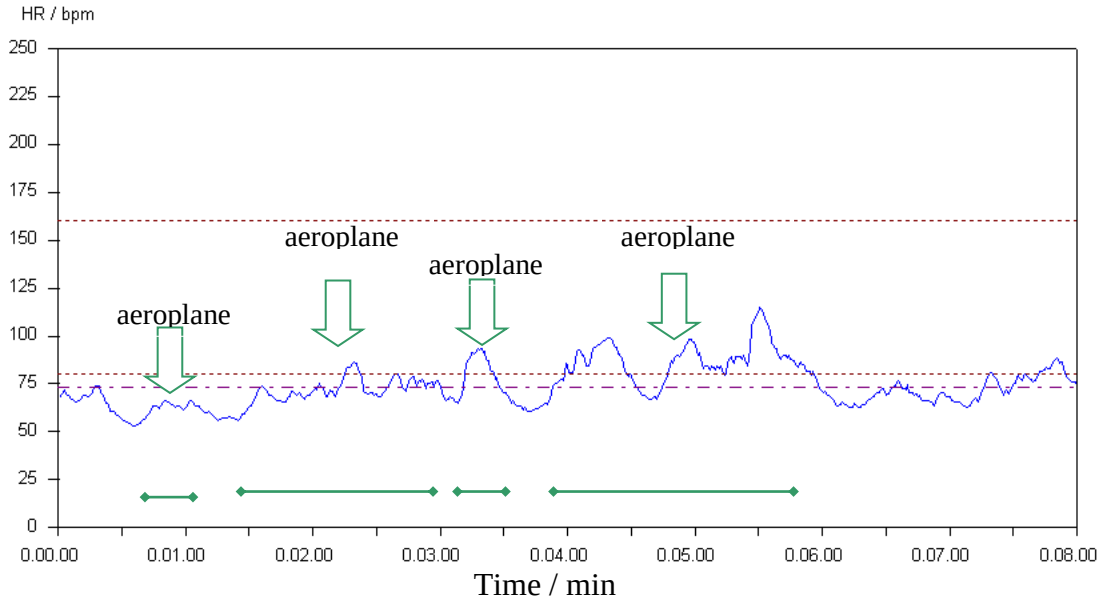

Fig 3: Mean HR over time of a yearling during the surcingle test

TABLE 2: HRV: time domain and frequency domain parameters during the surcingle test

	Time Domain Parameters				Frequency Domain Parameters		
	R-R max	**IBI**	**R-R min**	**RMSSD**	**LF**	**HF**	**LF/HF**
Treated	1359.3	1089.3	788.3	54.7	1818.2	725.1	43.4
Control	1359	1134.5	834.7	33.7	1259.0	421.6	42.1