Defecating behaviour of a horse (*Equus caballus*) in a box stall

Comparison between stallions, geldings and mares

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Abstract

The purpose of my investigation was to find out that *are there differences between horse stallions, geldings and mares in the degree of messing a box stall by defecating*. The difference between different sexes and castrated horses is in the amount of sexual hormones. Sexual hormones on the other hand affect the territorial behaviour of a horse, for instance stallions mark and protect their territory.

Data was collected in several stables in Oulu, Oulunsalo, Kempele, Muhos and Tyrnävä. The box stall was divided to nine equal sizes of squares assuming the size of a box stall to be 9 m^2 and the number of a bit and much messed squares were recorded. Together 74 horses were taken into the research: 15 stallions, 25 mares and 34 geldings. It was found out that there was a difference in a degree of messing a box stall by defecating between stallions and mares ($t \approx 2.350$, $df = 38$, $p < 0.05$), but not between mares and geldings ($t \approx 1.107$, $df = 57$, $p > 0.1$) or stallions and geldings ($t \approx 1.447$, $df = 47$, $p < 0.1$). This shows that stallions are the cleanest horses, after that come geldings and finally mares as the messiest ones.

It seems that when a male horse is castrated its defecating behaviour starts to resemble somewhat the defecating behaviour of mares. This gives rise to a further question; how does the age at castration of a stallion and the time passed from the castration affect the degree of messing a box stall by defecating.

Tiivistelmä

Tutkielmani kohteena oli selvittää onko orien, ruunien ja tammojen välillä eroja niiden karsinan sotkemisasteessa ulostamalla. Eri sukupuolta olevien hevosten ja kastroitujen hevosten välillä on eroja sukupuoli hormonien määrässä. Toisaalta sukupuolihormonit vaikuttavat myös hevosten reviiri käyttäytymiseen, mm. oriit merkitsevät ja suojelevat reviiriään.

Tutkimus datan kerääminen tapahtui usealla tallilla Oulussa, Oulunsalossa, Kempeleessa, Muhosella ja Tyrnävällä. Hevosen karsina jaettiin yhdeksään yhtä suureen neliöön, olettaen karsinan kooksi $9m^2$, ja vähän sotkuisten ja paljon sotkuisten neliöiden lukumäärä laskettiin. Yhteensä 74 hevosta otettiin tutkimukseen, 15 oria, 25 tammaa ja 34 ruunaa.

Tulokset osoittivat että oriiden ja tammojen välillä oli merkityksellinen ero karsinan sotkemisasteessa ($t \approx 2.350$, $df = 38$, $p < 0.05$), mutta ruunien ja tammojen ($t \approx 1.107$, $df = 57$, $p > 0.1$) sekä ruunien ja oriiden ($t \approx 1.447$, $df = 47$, $p < 0.1$) välillä ei ollut merkityksellistä eroa. Tutkimus osoittaa että tammat sotkevat eniten karsinaansa ja oriit vähiten, ruunat ovat tammojen ja oriiden välissä.

Näyttääkin siltä että kun ori kastroidaan sen karsinan sotkemiskäyttäytyminen alkaa muistuttaa tamman karsinansotkemiskäyttäytymistä, herää kysymys miten hevosen kastrointi ikä tai kastroimisesta kulunut aika vaikuttaa sen karsinan sotkemiskäyttäytymiseen ulostamalla.

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1.0 Introduction

For eight years I have been interested in horses (*Equus caballus*) and during that time I have learned to ride a horse, take care of them and also to some extend to understand their behavioral responses and patterns through own experience and natural horsemanship courses. However there is still a lot about their behavior left to be explored and interesting questions to be asked.

In the nature wild horses live in a herd, which is owned by a dominant stallion but usually lead in daily routines by an older mare ("alpha mare) (Williams 2004). The dominant stallion has a privilege to copulate with the mares of a herd. Horse is a harem breeder, which breeds in a certain breeding territory. The dominant or harem stallion has a group of females with their young, who he guards and defends from intrudes and predators, which is seen in stallions' behaviour, they are more likely to fight than to flee. The group is considered to be a relatively stable social unit. There is a strict social hierarchy in a herd, where the lower-ranking horse almost always gives way to a higher-ranking horse without a fight. (McDonnell 1992)

Horses in a social group have different communication methods with each other. Horses have a really good sense of smell; it is approximately 1000 times better than that of humans (Nieminen 2003). By the smell horses can distinguish each other and the members of the herd. (Milne 1962). Each kind of animal has its own special odour spectrum.

In territorial behavior of a horse defecation and urination are significant (Sebeok 1968). Territory is the area that an animal considers its own and marks out and defends against intruders. Stallions mark their territory with faecal piles (Nieminen 2003). In a herd stallion has a characteristic set of responses to urine and faeces that seem to be communication between horses. Faeces work as a medium of chemical signals. Horses sense pheromones, which e.g. tell a stallion if mare is in estrus and receptive for copulation (Nieminen 2003). When a stallion notices a faecal pile it almost ritualistically investigates the faecal pile, performs flehmen, urinates and defecates on top of the pile.

Also when entering a new area stallion walks from one fecal pile to another performing the same sequence of responses again and again (McDonnell 1992).

Faecal piles get enlarged because of frequent defecation on top of the same piles. These piles are called as stud piles and may be used by several stallions (McDonnell 1992). Faeces on top of a faecal pile belong to the dominant stallion in the territory, that's why stallion has to regularly circulate the boundaries of its territory in case of rival stallions. At times there comes a fight between rival stallions of territory boundaries and of the right to mate with the mares of the harem (McDonnell 1992).

Today there are just few herds of wild horses running free; the horse we work with is the domestic horse. Stallions are generally maintained in separation to other horses, because they are not wanted to produce offspring with every mare without control. There is not given a possibility for normal intercommunication between stabled horses; however they show similar kind of behavior as horses in nature.

Other possibility to control the reproduction of a stallion is castration meaning a removal of sex glands, testicles. Castration causes a change in hormone levels which decreases stallion's sexual desire and it usually calms down. According to McDonnell (1992) pre-puberally castrated colts generally do not develop normal sexual behaviour. The puberty age varies between 18 months and 24 months (Courot 1984). The castration of post-pubertal, mature stallion, generally leads to a reduction in sexual response. However near-normal sexual behavior may persist long after castration. A horse may need as long as 4-6 months to mentally and physically forget he was a stallion.

When cleaning my horses' stalls I noticed that there were differences in their defecating behaviour. My gelding was a quite clean horse; all the faeces were in a same pile. My mare instead defecated all over the stall without any logic at all. The characteristic traits of different genders, mares and stallions, are caused by sexual hormones.

Testosterone is a male hormone stimulating male sexual responses and is responsible for the secondary sexual characteristics such as muscular development (Hayes 2002). Stallions have higher levels of the testosterone than are found in geldings. Gonadal hormones play an important role in stallion's behaviour (McDonnell 1992). Hence it can be assumed that sexual hormones affect the defecating behavior of a horse and are strongly linked with the territorial marking behavior of a stallion.

When stallion is castrated its sexual interest abates which should reduce the territorial marking behaviour. The reason for this is that gelding can't reproduce and thus do not need to compete for the right to mate. When time lapses from the castration the stallion kind of behavior reduces, due to the change in male hormone levels.

Mares are seasonally polyoestrous (Asdell 1964). They show cyclical active oestrus and dioestrus, which are caused by hormones. During the time of oestrus mares are receptive to the stallion, which they show by frequent urination, spreading hind legs and winking the vulva. There has not been found a similar noticeable reproductive cycle in stallions caused by changes in hormone levels as in mares. This means that stallions are always "neutral". Mares could be called neutral when they are not suckling a foal, expecting a foal and not in oestrus.

1.1 Research Question

The aim of my research was to investigate *if there are differences between horse stallions, geldings and mares in the degree of messing a box stall by defecating*. Due to differences in sexual hormone levels between different sexes and castrated horses my hypothesis is that there are differences between stallions, geldings and mares in the degree of messing a box stall by defecating.

In mares the level of oestrogen, the female characteristics producing hormone, is relatively higher than in stallions. In a same way in stallions the level of testosterone, the male characteristics producing hormone, is relatively higher than in mares. As a

consequence of castration the production of testosterone decreases in geldings and thus the relative levels of oestrogen and testosterone in geldings get closer to each other. My assumption is that the decrease in testosterone hormone production in geldings causes geldings to resemble mares in defecating behaviour. Which leads to my prediction that mares defecate to a larger area than stallions and geldings resemble both mares and stallions in their defecating behaviour, because geldings have lower testosterone levels than stallions but higher than mares.

The back side of a box stall (opposite to the eating place) is the normal place of defecating for a horse when it is eating as it mostly does when being in a stable. Thus I assume that at first every horse messes the back side and after that chooses some other part of the box stall to defecate. This also relates to my prediction that a stallion marks its box stall usually with one or couple of faecal piles which are placed on the back side, because after once marking his box stall, there is no need to do it again if there have not been any competitors in his area and the box is familiar to him.

I decided to study defecating behaviour in a stable and not in a pasture. In a stable horses have limited space and limited time for outdoor exercise. Some horses which are stabled for most of the day show abnormal behaviour as an effect of frustration for example wind sucking, frequent urination and weaving. However domestic stabled horses have the same kind of traits and properties as wild horses.

2.0 Material and Methods

2.1 The degree of messing a box stall

I made some preliminary investigations by observing defecating behaviour of my two horses in our stable for a week and three of my friend's horses for one day. In the preliminary investigation I had 3 mares and 2 geldings of which two were Finnish horses, one American warm blood, one new forest pony and one Shetland pony. All of them were of different age, between 4 and 16 years.

The mean size of a box stall of a middle sized horse (height 1.55 m) was 3m x 3m. I divided the box stall into 9 (3 x 3) squares each of size about 1m x 1m. One square represents one area, where the horse can defecate. The reason why I decided to divide the stable to 9 squares and not for example to 16 (4 x 4) was that when making preliminary work I noticed that the area taken by one faecal pile was about 0.4 m x 0.4 m = 0.16 m^2 which means that about 6 faecal piles fit to one square. My purpose was not to have a square having a size of one faecal pile; otherwise it would have been same to calculate only the number of faecal piles, but it was more convenient to determine the number of different messed squares than the number of faecal piles, and nine areas seemed to be a convenient amount. There are also fewer possibilities for faecal piles which are on the borderline of two squares, when the area of a square is noticeable larger than the area of a pile.

It is not very probable that all faeces stay in a pile shape, because they are easily walked over in a stall. Before preliminary investigation my purpose was to divide the degree of messing to three, a bit messy, messier and more messy, but after investigations I ended up dividing messed squares to much messed and a bit messed squares. Much messed square (Picture 2) means that there is found at least one whole faecal pile inside the square and a bit messed square (Picture 1) is determined to be a square which has only few (but more than 5) pieces of faeces. I also noticed when doing preliminary investigations that the mean number of whole faecal piles produced during 12 hours in a stable was 4-5 piles. According to McDonnell mature mares defecate 4-15 times per 24 hours in a box stall. The normal time horses spend inside a stable is between 8-15 hours. If horse is a very clean one it defecates to a very specific area in a box stall. When the area of a square is 1 m^2 all the five piles of the horse fit to the same square.

Picture 1a. A bit messed square

Picture 1b. Much messed square

2.2 The horses

The data collection happened in various stables (Appendix, Table 2). Data was collected during July, August, September and October 2004. 34 geldings, 15 stallions and 25 mares were taken under investigation (Appendix 1,2 and 3). Only horses over 2 years old were taken into the research, because that is the age when most horses are physically mature to reproduce. The age of the horses ranged from 2 to 30 years. The mean age of geldings was 11.6 years, mares 8.9 years and stallions 6.8 years. Stallion's low mean age is explained by the fact that most stallions are castrated before the age of ten.

The age at castration and time passed from castration of geldings were recorded (Appendix 1). The age at castration varied between 2-8 years and the mean was 3.5 years. The time passed from the castration varied between 1-28 years and the mean was 8.1 years. Horses were of nine different breed, Finnish horse being the most common breed (38 % of all horses), warm blood (19 %) being the second common and as a third common came half blood (15 %).

Horses which were or had been under medical treatment under the last three months or had some kind of sickness or illness which might cause changes to their normal defecating behaviour, were not taken into the investigation. The consistency of faeces also had to be normal: not too slack, of normal green yellowish colour and not containing anything abnormal for example undigested oats or helminths. The diet of a horse was considered to be normal if it contained only hay, oats, minerals and salt. All extra food like sugarbeet bulb and different compounds consisting of balanced blends of ingredients and nutrients, like racing prix were recorded.

All horses lived in a stable with 1-30 other horses. The most common arrangement concerning the neighbors of the horses was that one of the adjoining boxes were empty and as another neighbor mare often had a mare, stallion had a stallion, and gelding had a gelding. Mares and stallions were almost never put to be in neighboring boxes, but stallions had sometimes geldings as their neighbors.

The size of a box stall varied between 2-9 m^2, however over 82% of the horses had a box stall of size between 8-9 m^2. Horses which had a smaller box stall were usually small horses or ponies. Also the shape of the box stalls had some variation. Most commonly the box was a square, but sometimes a rectangle, when the defined "squares" were more rectangle-shaped.

In over 89 % of the box stalls the used bedding material was cutterchips, only 11% of the horses had turf as a bedding material. There were not big differences in the used bedding material between different sexes of horses. Cutterchips and turf have differences in their fluid absorbing capacities, but other properties concerning their use are quite similar.

2.3 Data collection method

When visiting different stables it was important that there was someone who knew the horses and could answer my questions concerning the horse's age, diet, etc. Data concerning the box stalls was collected at the same time as the stalls were cleaned. In a box stall before cleaning I first looked the eating site, where the horse had eaten its hays and had a food basin. I made observations of the faeces and if they looked normal I recorded the number of squares which were much and a bit messed (Appendix 4). Box stall was not measured with a tape measure only an estimate of its size was given in an accuracy of ± 0.5 m*0.5 m. Also the borders of the squares were not marked and measured, but if there were some faecal piles which seemed to be on a borderline between two squares, tape measure was used to check. The significance of the results was tested using t-test and chi-squared test (Ranta, Rita, Kouki 1989).

3. 0 Results

On average mares messed more squares in a box stall by defecating than stallions ($t \approx 2.350$, $df = 38$, $p < 0.05$) (Table 1). Meaning that the means of total number of messed squares (Figure 1.) between mares and stallions were statistically different from each other, however there was not found a statistical difference between mares and geldings ($t \approx 1.107$, $df = 57$, $p > 0.1$, ns.) and stallions and geldings ($t \approx 1.447$, $df = 47$, $p < 0.1$, ns.) when comparing the means of total number of messed squares.

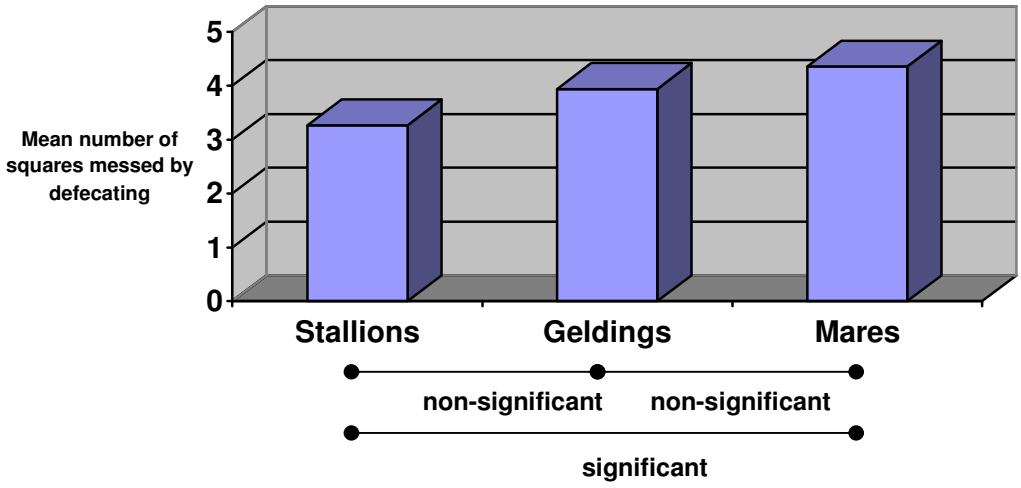
Table 1. Mean number of squares messed by defecating between stallions, geldings and mares in a box stall

Gender	Mean number of squares messed by defecating		
	Total	Much	A bit
Stallions	3.267	2.400	0.867
Geldings	3.941	2.794	1.147
Mares	4.360	3.400	0.960

*Much messed square means that there is found at least one whole faecal pile inside the square and a bit messed square is determined to be a square which has only few (but more than 5) pieces of faeces.

For all genders the relation between much and a bit messed squares in a box stall was approximately 3:1 (Figure 1). This means that the relation between much and a bit messed squares is not different for messy and clean horses. Hence stallions as the cleanest horses do not have more a bit messed squares compared to the number of much messed squares, and on the contrary mares as the messiest horses do not have more much messed squares than a bit messed squares. The difference is in the total amount of squares messed.

Figure 1. Mean number of squares messed in a box stall by defecating between stallions, geldings and mares



When determining clean horses to be those who mess 1-2 squares and thus messy horses to be those who mess 3-9 squares by defecating, I was able to determine using Chi-

squared test whether it depends on the gender of a horse that a horse is clean or messy. Chi-squared test supported my prediction that the degree of messing a box stall by defecating (clean or messy) is dependent on whether the horse is a stallion or a mare (χ^2 = 5.966, df = 1, p< 0.05) and that the castration of a horse doesn't make gelding to be totally different from the stallions in the degree of messing a box stall by defecating (χ^2 = 1.620, df = 1, p >0.1, ns.) but also not totally different from mares (χ^2 = 3.637, df = 1, p >0.05, ns.). This means that geldings are messier than stallions, but cleaner than mares.

4. 0 Discussion

My results supported my hypothesis that there is a difference between mares and stallions in the degree of messing a box stall by defecating. Mares are messier than stallions and as I predicted they messed more squares in a box stall than stallions.

Geldings on the other hand weren't totally different from mares neither from stallions in their defecating behaviour, which leads to a conclusion, that when a stallion is castrated it starts to resemble mare in its defecating behaviour. Geldings are messier than stallions but cleaner than mares. We also get support to the assumption that sex hormones affect the defecating behaviour of a horse.

These results give raise to further questions, how the age at castration or the time passed from the castration affects geldings' defecating behaviour. It could be assumed that the longer time has passed from the castration the messier the gelding will be, because the level of male sex hormone level decreases closer to mare's hormones. Of course the testosterone level will not decrease endlessly; there must be a certain lower level which every male has to keep up. The same effect could be seen when comparing two geldings one which has been castrated at age 2 and other at age 7, gelding which has been castrated earlier is messier than gelding castrated at age 7, who has been a stallion for a longer time and has created "stallion kind of behaviour".

The time of making my investigation was not during the normal breeding season of horses which is usually during spring and early summer. During fall and winter the sexual hormone levels are lower and the sexual behaviour of a horse is not as active.

Stallions that are used in breeding quickly learn the breeding routine to which they are exposed (McDonnell), however stallions that have never been used in a breeding and live in isolation from mares or other horses have a lower concentration of testosterone and do not necessarily develop normal sexual "stallion kind of behaviour".

Horses are social animals and to the extent possible they interact with the stable mates. Neighboring horses tend to respond simultaneously to an environmental event. The same way horse's neighbors can affect the defecating behaviour of the horse. It is not known if the defecating behaviour is also related to learning. Some horse owners that I have spoken with have noticed that their foal had a similar kind of way to mess a box stall by defecating as the mother of the foal had. However the effect of sexual hormones on the defecating behaviour of a horse is significant.

Other factors that can affect the defecating behaviour of a horse are different gene heritage and environmental changes or disturbances. Moving from other stable to another and the change from familiar environment to a totally new environment can upset the hormonal balance of the horse causing a change in its defecating manners. I think horses have certain daily routines in their defecating behaviour; they tend to defecate to certain places at a certain time every day, if they are not disturbed by a change in other learned daily routines, e.g in feeding and exercise times.

The dysfunction of a digestion caused by a sickness or inherited factor also can cause changes in a defecating behaviour, for that reason horses which had been lately sick or given some medicin were not taken into my research. Also mares which were expecting a foal, in an oestrus, lived with a foal or had sometimes had a foal were not taken in because during the different phases of their reproductive cycle, they have different amounts of hormones (e.g. progesterone).

My investigation could be extended by measuring the hormonal levels of each horse taken to the investigation and also investigating the factor of age at castration and time passed from the castration to the defecating behaviour of a horse. It would also be

interesting to investigate the defecating behaviour of horses in a pasture in a natural herd to see the influence of a not restricted social communication to the defecating behavior. The testosterone concentration in stallions is also dependent on the sociosexual conditions (McDonnell 1995). A herd in a wild nature consists of mares and stallions not of geldings making me wonder how the participation of geldings changes the social structure of a natural herd and how it affects the defecating behaviour of a horse.

If I would do my investigation again I would probably also calculate the number of whole faecal piles, and compare that number to the number of squares messed by defecating. However there is a problem in calculating the number of faecal piles because some piles may be walked over and been spread all over the stall making the separation of two faecal piles hard. It would be also interesting to find out what the results would be if the box stall was divided into 16 squares instead of 9 squares, is the difference between stallions and mares clearer or not.
Some geldings may behave like stallions which can be caused by bad castration (S.E.B). There are also individual differences between horses, for why the sample sizes must be enough big to get a reliable overview of the horses. I know I should have had more stallions than 15 in the research, but finding stallions is not as easy as finding geldings, because most people who have horses own only one stallion and usually the stallion is 1-2 years old.

There were quite many factors which could have affected horse's defecating behaviour, but which weren't controlled, e.g. the age of a horse or the sex of the stall neighbors. This is one of the error factors in the experiment but on the other hand we don't know for sure that they have some effect on the defecating behaviour of a horse.

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Appendix 1

Table 1. Geldings

Name of the horse	Year of birth	Age/ years	Year of castration	Age at castration/years	Years gone from castration	Number of squares messed			Number of squares messed					
						Total	much	a bit	eating place	back side	corner	Side left, right	middle	Front of door
Capitolo	1994	10	1997	3	7	2	1	1	-	2	2	-	-	-
Cabare	1993	11	1995	2	9	1	1	-	-	-	-	-	Yes	-
Colorado	1995	9	1997	2	7	1	1	-	-	-	1	-	-	-
Rex	1998	6	2000	2	4	9	3	6	yes	3	4	both	Yes	Yes
Kehveli	1981	23	1987	6	17	8	1	7	yes	3	4	Both	Yes	Yes
Tuisku	1985	19	1988	3	16	3	2	1	-	2	1	right	-	-
Pirskatti	1985	19	1987	2	17	7	5	2	-	3	3	both	Yes	Yes
Epper	1999	5	2002	3	2	4	4	-	-	3	2	right	-	-
Perillus	1998	6	2002	4	2	3	3	-	-	2	1	left	-	-
Hilanteri	1992	12	1999	7	5	3	3	-	-	3	2	-	-	-
Tommy II	1985	19	1988	3	16	6	6	-	-	3	3	both	-	-
Salama	1982	22	1986	4	18	4	4	-	yes	3	3	right	-	-
Rashik	1974	30	1976	2	28	2	1	1	-	2	-	left	-	-
Liinan Henri	1992	12	2000	8	4	4	3	1	-	3	2	Left	-	Yes
Ekeri	1998	6	2002	4	2	3	3	-	-	3	2	-	-	-
Agar	1999	5	2002	3	2	3	3	-	-	3	2	-	-	-
Teddy Killer	1998	6	2000	2	4	7	4	3	yes	3	3	Both	Yes	-
Bonjour	1984	20	1988	4	16	1	1	-	-	-	1	-	-	-
Hilton Hiku	1993	11	1997	4	7	3	3	-	-	3	2	-	-	Yes
Tibere des vallees	1985	19	1988	3	16	6	4	2	-	3	3	Both	-	Yes
Rocky	1983	21	1986	3	18	3	3	-	-	3	2	-	-	yes
Celltas Killkenny	1989	15	1992	3	12	2	2	-	-	2	1	-	-	-
Hilton Tähti	1996	8	1998	2	6	2	2	-	-	2	1	-	-	-
Tee Pee Harmony	1994	10	1996	2	8	3	2	1	-	1	1	Left	-	-
Fast Guy	1997	7	2000	3	4	2	1	1	-	2	1	-	-	-

Continues…														
Table 1. continues														
Tähti-Jussi	1994	10	1998	4	6	1	1	-	-	-	1	-	-	-
Drolex	1988	16	1996	8	8	1	1	-	-	-	1	-	-	-
Hervan Poku	1993	11	1999	6	5	2	2	-	-	2	1	-	-	-
Vilijam	1998	6	2002	4	2	8	2	6	yes	2	3	Both	Yes	yes
Soiman Tähti	1999	5	2003	4	1	5	4	1	-	2	2	right	Yes	-
Bellty Boy	2001	3	2003	2	1	3	2	1	-	2	1	left	-	-
Gregory Steel	1999	5	2002	3	2	8	5	3	-	3	3	both	yes	yes
Eurotex	2001	3	2003	2	1	5	3	2	-	3	2	left	yes	-
Patroll	1998	6	2001	3	3	9	9	-	yes	3	4	both	yes	yes

Table 2. Horse stables visited for the research

Name of the stable or the owner	Place (in Finland)
Oulun Pokaalin tilapäinen talli	Oulu
Saaran talli	Oulu
Koivikon ratsutila	Kempele
Merikosken talli	Muhos
Vimparin talli	Muhos
Karhun Ossin talli	Tyrnävä
Leinosen Katrin talli	Tyrnävä
Juolan Niinan talli	Tyrnävä
Tervon Pekan talli	Tyrnävä
Lambergin Riikan talli	Tyrnävä
Yksityis talli	Oulunsalo
Viialan Sallan talli	Muhos
Kamulan Irjan talli	Tyrnävä
Palmrosin Sannan talli	Tyrnävä
Huovisen Sannan talli	Tyrnävä

Appendix 2

Table 2. Stallions

Name of the horse	Year of birth	Age/ years	Number of squares messed			number of squares messed					
			total	much	a bit	eating place	back side	corner	Side left, right	middle	Front of door
Liljan Ville	2001	3	8	4	4	yes	3	4	both	-	yes
Villen Rami	2002	2	6	4	2	yes	3	3	right	yes	-
Viksu-Ville	1999	5	4	4	-	-	3	2	left	-	-
Tas Mancell	1993	11	1	1	-	-	-	-	left	-	-
Veli Kulta	2000	4	6	2	4	-	3	3	right	yes	yes
Tähti-Hessu	2000	4	1	1	-	-	-	-	left	-	-
Verjori	2002	2	3	3	-	-	3	2	-	-	-
Tilun Armas	2001	3	2	2	-	-	2	1	-	-	-
Tilun Aatos	1998	6	1	1	-	-	1	1	-	-	-
Valpperi	2001	3	2	1	1	-	2	1	-	-	-
Pelari	1975	29	5	4	1	-	2	2	left	yes	-
Aatu	1989	15	4	4	-	-	3	2	left	-	-
Caster Baron	1993	11	1	1	-	-	1	1	-	-	-
Veslaus	2002	2	1	1	-	-	1	-	-	-	-
Piskon Muisto	2002	2	4	3	1	yes	2	2	right	-	yes

Appendix 3

Table 3. Mares

Name of the horse	Date of birth	Age/years	Number of messed squares			Messes /number of squares					
			total	much	a bit	eating place	back side	corner	Side left, right	middle	Front of door
Nienke	1995	9	3	3	-	-	3	2	-	-	-
Korholan Fatima	1991	13	4	3	1	-	3	2	left	-	-
Light Rose	1996	8	5	3	2	-	3	2	both	-	-
Hehkuva Taika	2001	3	3	1	2	-	3	2	-	-	-
Gana	1981	23	3	2	1	-	2	1	-	-	-
Moenja	1994	10	6	6	-	-	3	2	both	yes	-
Kustaava	1985	19	4	2	2	-	2	1	right	yes	-
Juliette	1990	14	3	2	1	-	2	1	right	-	-
Farle	1994	10	3	3	-	-	2	1	Left	-	yes
Avicenna	1999	5	4	3	1	yes	3	2	-	-	yes
Venta	1999	5	4	4	-	-	3	3	Left	-	yes
Burning Brunette	1999	5	9	9	-	yes	3	4	Both	yes	yes
American Sophie	2000	4	6	5	1	-	3	3	right	yes	-
Princesse Aubiose	1992	12	4	4	-	-	3	2	left	-	-
Unfaithful	2001	3	4	3	1	-	2	1	right	yes	-
Rahkolan Virkku	1997	7	6	5	1	-	3	2	both	yes	-
Fluing Amanda	1999	5	6	5	1	yes	3	3	right	yes	-
Sällin Suttura	2001	3	4	2	2	-	2	2	right	-	-
Remmariini	2001	3	8	5	3	yes	2	3	both	yes	yes
Kiituri	1992	12	5	4	1	yes	1	1	both	-	-
Excel Stella	1999	5	2	1	1	-	1	1	-	-	-
P.V Virha	1983	21	6	5	1	-	3	3	left	yes	-
Swift Baroness	1986	18	1	1	-	-	-	-	left	-	-
Soiman Peetruska	2000	4	3	3	-	-	3	2	-	-	-
Action Downhill	2002	2	3	1	2	-	2	1	right	-	-

Appendix 4

Research form

Horse data:

Name:_____
Race:_____
Owner: _____
Date of birth: _____ /_____/_____
Date of sterilization: _____/ _____ / _____
Sex: gelding / mare / stallion
Father:_____ Mother:_____
Special diet (in addition to hay and oats):
_____
_____
Additional remarks (eg. foaling mare, has had a foal, illnesses, medicines, stallion/mare kind of behaviour, environmental changes, new place, others…)
_____
_____

Box data:

Bedding material: sawdust/ cutterchips/ turf/ else _____
Size of the horse box: _____ m x _____ m
Number of horses in the stable building _____
Sexes of the side neighbors:
left: gelding/ mare/ stallion/ empty
right: gelding/ mare/ stallion/ empty
How long from the previous cleaning: about _____ h