

Investigations of daily biorhythm in different horse keeping systems for well-being measured with ALT pedometer

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Abstract

A new type of pedometer, named ALT pedometer, was developed for using in cattle and horses. **ALT** is the synonymous for **a**ctivity, **L**ying time, and **T**emperature. The pedometer system register the three parameter activity, lying time, and temperature for an accurate determination of the daily biorhythm of horses. It was tested in stud-farms in Germany and Switzerland. The main reason for these investigations was the question - is the present dimensions of single boxes, single boxes with run and pasture area sufficient and suitable for horse keeping?

Keywords

Precision Livestock Farming, sensors, well-being

Introduction

The growing distribution of the sports and saddle-horse keeping in the complete EU area require a customization of the legal bases and framework conditions for the individual countries for the horse keeping under the aspects of well-being in horse keeping systems in stable plants and the keeping claims of horses on pasture keeping.

Well-founded statements concerning the daily biorhythm - activity behaviour, rest periods - must basis new, revised guidelines and regulations of the keeping order of horses scientifically for these animals.

For the on-stables and accommodation of the horses modern, suitable for manners keeping systems should find, the both the needs of the animals, the needs of man and have the protection of the environment in the look. Horse keeping suitable for manners is not only a demand of the protection of animals law but takes a high general request into account particularly at the aspects of the sustainability and the environmental compatibility. The most frequent form of the individual keeping is the single box but also outer boxes and outer boxes with run, a directly adjacent little pad dock, are used. The group housing for horses in great boxes (closed stable building without permanent entry to a run) and the loose barn belongs to the group of keeping systems. One understands an increase area system by a loose barn

with a lying area in a stable building, an eating area into or outside the stable building and for a run area it is outside the stable building, permanently accessible to this one.

Newer investigations give tips to the fact that especially rank-low animals show a decreased rest behaviour in the lying time in the group, because they are disturbed over and over again by more high-ranking during her quiescence and sleeping phases [6,7]. Sleep is an essential need, and deep sleep is of vital importance for all mammals. This is possible with horses only in the lying in the belly position and side position as on the basis of EEG and muscle tone measurements could be ascertained [9,14]. Adult horses rest about seven hours during the day from what they spend approx. 20 % in the lying. Although horses rest, indeed, predominantly in the standing position (doze), must be still guaranteed also in the group keeping that an enough largely limited, as well as dry and malleable lying surface is available, so that all horses are at a distance unhindered at the same time and get up as well as can sleep in side position. Pilot studies show that structuralizations of the lying areas can affect in loose barns positively the frequency of lying periods and duration, especially rank-low horses.

New development of a pedometer system, called ALT pedometer, to register activity, lying time, and temperature for an accurate determination of the daily biorhythm for horses was tested in stud-farms in Germany and Switzerland.

The main reason for these investigations was the question - is the present dimensions of single boxes, single boxes with run and on the pasture sufficient and particularly for horse keeping.

Material and Methods

It is main concern of the research project on hand to provide the legislation in the area of the protection of animals and the appropriate to the species keeping of horses, by a scientific analysis of the keeping systems used in Germany to provide a sound data material to the movement activity and to the lying phases or quiescence of horses in the daily biorhythm. In addition, broader knowledge shall be collected by horses to the optimization of the group keeping so that the wording is made possible more clearly for guidelines and recommendations also in this area. For an animal which is daily on an average just 19 hours in movement under natural conditions an everyday movement duration of less than one hour shows a considerable restriction of appropriate to the species behaviour patterns. Different investigations have shown that lack of exercise in the horse can cause a whole row of illness and with it connected suffering and pains and is often early departure cause for horses [7,10,11,13].

This is also reflected in insurance statistics again in which illnesses of the movement apparatus with an interest of more than 50 % are listed as a main departure cause for riding horses

[6,9]. By lacking movement offer the tendons, tapes and joints lose her elasticity and strong charges as they appear today in the horse-riding, affect quickly damaging. Only with the neutral horses can do her well-being motion sequences as the preferential slow walking in the step, but also humps and plays freely unfold. Investigations show that only the loose barn can cover with separate functional areas and the all-day pasture way the movement need [1,2,3,8,11]. Hence, the veterinary union also recommends for protection of animals that in all single keeping systems an everyday several hours of movement possibility is to be offered to the horses to the balance for the activity loss. And the necessary movement is to be guaranteed by free running, if necessary complements with work or training.

The mode of operation of pedometer for the measuring parameter "animal activity" works according to the principle of the impulse counting. ALT stands for activity, lying time and temperature at it as synonymous. The decisive advantages of this type of pedometer lie in the following features:

- Measuring of three animal individual parameters (activity, laying time, surroundings temperature at the pedometer), instead of one feature only (activity) in the conventional pedometer;
- eligible time interval for the recording of all parameters in the measurement range between 1 and 60 min;
- the defined assignment of all data sets to the day of the biorhythm permits the real time clock in the ALT pedometer;
- continuous measuring data acquisition, data storage and manual or cyclical automatic data transmission over arbitrary time periods after predefined measuring interval by means of radio modem to the PC;
- the high correspondence between activity and lying time permit secure statements for daily biorhythm of horses.

The pedometer contain four sensors to the recording of the step activity, the lying time in two different lying positions and the surrounding temperature. The results from temperature relations permit conclusions in the lying area of the animal and with it on the well-being. A μ processor, the data memory, the real-time clock, a lithium battery and the radio module to the wireless data transfer complete ALT pedometer. The μ processor grasps temperature, step activity and lying positions of the animal continuously and sums these up about the measuring interval configured at attempt beginning (1 to 60 min). The sum of the step activity, the lying times and the surrounding temperatures unite a data set. The storage capacity of an ALT pedometer amounts to 740 data sets [4].

First investigation took place in Neustadt/Dosse (Germany) in single inside boxes only with stallions and mares over two weeks [4]. In Switzerland three investigations were carried out. First in Bellelay with stallions and geldings in single inside boxes and boxes with run over three months [5].

Results

The statistical evaluation of the data was carried out with EXCEL 97 and S-plus 6.1.

The movement activity of our using is an incorruptible indicator for animal welfare of the elective keeping system regarding the assessment of animal health, fertility, performance, well-being and balance.

One knows individual or single and group keeping systems for horses today. The most frequent form of the individual keeping is the single inside box but also outer boxes and outer boxes with run, a group keeping systems under each other in the same keeping unity. From investigations is known that approximately 84 % in single keeping and only about 16 % in group keeping are held by the whole horses continuance [2,3,7,12,15]. The horses in single keeping are moved on average five hours per week beyond the single box. This means that horses stay in single keeping systems approximately 23 hours daily in her single box [1,4,6]. Different investigations have shown that lack of exercise in the horse can cause a whole row of illnesses and with it connected suffering and pains and is often the early departure cause for horses. In the examinations the trend could be confirmed obviously that, generally, horses showed a higher movement activity than in the inside box ($P = 0.0547$) in the individual box with run. From this one of the central results of this work follows: Animals with run showed according to tendency a higher average movement activity than without run. One compares the mean average values of the movement impulses of the animals in the variants or without run the stallions showed with run 33.82 % more movement impulses so that without run and the geldings 52.54 %. It is a strong trend act, however, that horses moved under condition with run more than in the variant without run [5].

The analysis pointed, that the movement activity of the stallions and geldings about distributed the whole day with run was higher than without run. No entry to the run had the horses from 5:00 p.m. hours till 9:00 a.m. hours. The results showed that all stallions and geldings behaved quietly at night. The low of the movement activity was reached at 2:00 a.m. hours. The results show a clear trend for the fact that the movement activity can be raised by horses by the offer of a run accessible during the day. It could be shown that horses often stayed at choice in the run. The geldings stayed in the run during on an average 37.63 % of time, the stallions during 65 % of time. In even clearer values this trend at this is compare to recognize

the keeping variants (Fig. 2) - single inside box without run and pasture keeping [5]. The comparison you see in Figure 2 between the test periods on the pasture and in single inside box from a stallion. The graphic makes clear that the daily biorhythm on the pasture is the most well-being system for horses.

Figure 1 shows the results from daily biorhythm in a single inside box over two week from a stallion, bed conditions for animal well-being.

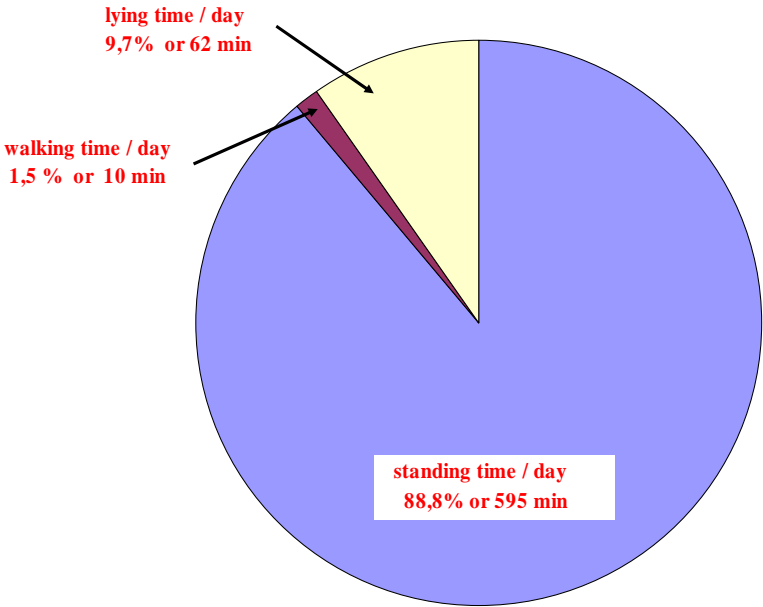


Figure 1. Daily biorhythm from "Kitaro" - single inside box (measuring time: 00:00 to 24:00 o. c.)

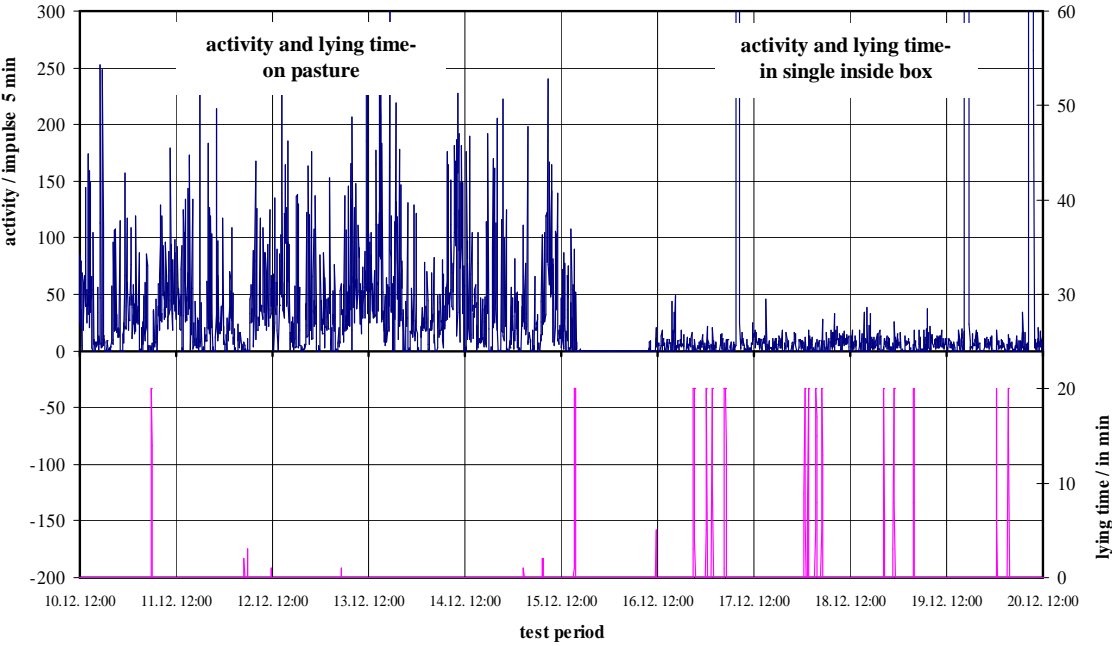


Figure 2. Comparison between activity and lying time from stallion "Lorambo" (Parts of the test periods on the pasture and in single inside box)

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