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## SYSTEM RECORDING BEHAVIOURAL CHARACTERISTICS OF PIGS – PREFERENCE FOR DIFFERENT FLOORING SYSTEMS

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### Abstract

The aim of this project was to identify the preference behaviour of fattened pigs in differently designed housing methods. The sensor-based identification allowed the constant registration of the behaviour of 21 pigs towards different surrounding offerings throughout the whole fattening period. The basic approach assumes that preference towards different kind of areas can be illustrated as a function of time (duration of stay, period of stay).

The experiment described below, housing on a totally slatted floor was compared to housing on a partly slatted floor. Over the whole fattening period the preference for the partly slatted floor could be studied.

*Keywords:* pig, preference behaviour, flooring systems, sensorbased analysis

### Hízósertések preferenciája különböző padozatok iránt

#### Összefoglalás

A szerzők célja volt sertések (n=21) padozatok iránti preferenciájának vizsgálata, különböző tartástechnológiákban. A sertések viselkedésének folyamatos megfigyelését a hizlalás alatt szenzoros egyedazonosítás tette lehetővé. A különböző padozatok preferenciáját az időtényező segítségével jellemezték (adott területen töltött időtartam, illetve gyakoriság).

Kétféle padozatot hasonlítottak össze a kísérlet során: a teljes rácspadozatú technológiát és a csak részben rácspadozatos technológiát. A hizlalás egész időtartama alatt a csak részben rácspadozatos területet részesítették előnyben az állatok.

*Kulcsszavak:* sertés, preferencia, padozat, szenzoros azonosítás

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## **Introduction**

Countries having a specialized system of pig husbandry, housing of feeding pigs is characterized by a quick change and a high concentration of live stock, by a high degree of automation and mechanisation, by a low demand of labour force and by a profitable transformation of food into saleable products. In Germany 89 % of pig husbandry is characterised by the conventional, dammed and litter-less stall (*Destatis, 2005*). This system is applied for huge live stocks as for small stocks up to 50 animals. Most of these stables are air conditioned, furthermore the floor is partly or totally perforated and limited space requirements for the animals ( $< 0,75 \text{ m}^2/\text{animal}$ ).

Such a housing environment offers a highly limited space and sense-offerings. But, anyhow, the demands of pigs should be fulfilled. The dimension and consistence of the floor is highly important. The EU-Directive 2001/93/EG defines minimum standards for the protection of pigs and regularises the minimum size of dimension. The consistence means that either a litter-less and perforated floor or a littered husbandry system is used. The floor, regardless of which consistence, has to satisfy different demands of the behaviour-repertoire of pigs, e.g. exploration, elimination, ingestion and lying. The thermal property of the floor is very important, particularly during the lying-phase (*Rudovsky et al., 2002*).

At cool environmental temperatures and high heat demand of younger pigs, respectively, the floor should have a preferably minor heat conduction and therefore prevents chilling of animal body. At high environmental temperatures and during last phase of the fattening, respectively floors with a higher heat conduction are preferred caused by lacking transpiration capacity of grown-up pigs. As a matter of principle, the floor should be clean and dry. Additionally, properties like prevention from slipping and a plain floor without any differences in level reduce the risk of injuries increasingly (*Rudovsky et al., 2002*).

Conspicuousness in behaviour are especially noticed in husbandry systems being poor of attractions, therefore behaviour of exploration is realigned to fellows. At the end, abnormal behaviours like biting tails or ears and even cannibalism is the direct consequence of the husbandry system (*Sambraus, 1991*). Besides resulting economic disprofits, such a behaviour has to be avoided on the strength of animal protection. An increasing interest in exploration can often be studied in stables with a high degree of occupancy besides without backup facilities and blinds for weaker animals, respectively. By providing some adequate possibilities of activity remedy can be given.

## Objectives of study

As a result of changing demands of pigs in different ages and behaviour-sections difficulties concerning the assessment of the demands can be studied.

Because of the two actual research projects with their different arrangements differentiated solutions of the problems in feeding pig husbandry were pursued. A central point is that pigs did show their demands by choosing an alternative. An evaluation and analysis of preference, affinity and compensation between the different attractions of the husbandry was possible.

A contribution to an objective and improved pig husbandry in consideration of animal protection should be given.

## Materials and methods

### Investigation

The research design is based on a sensor-based system. As opposed to video or direct observance it was possible to examine and analyse continually behaviour of pigs in an objective way during a long period of time. In any experiment, maximal four marked-off areas with different offerings were provided for 21 growing pigs during the whole husbandry-period (Area A to D) (Figure 1). A and B offered closed and built up lying-areas. These can be designed as huts equipped with different floors.

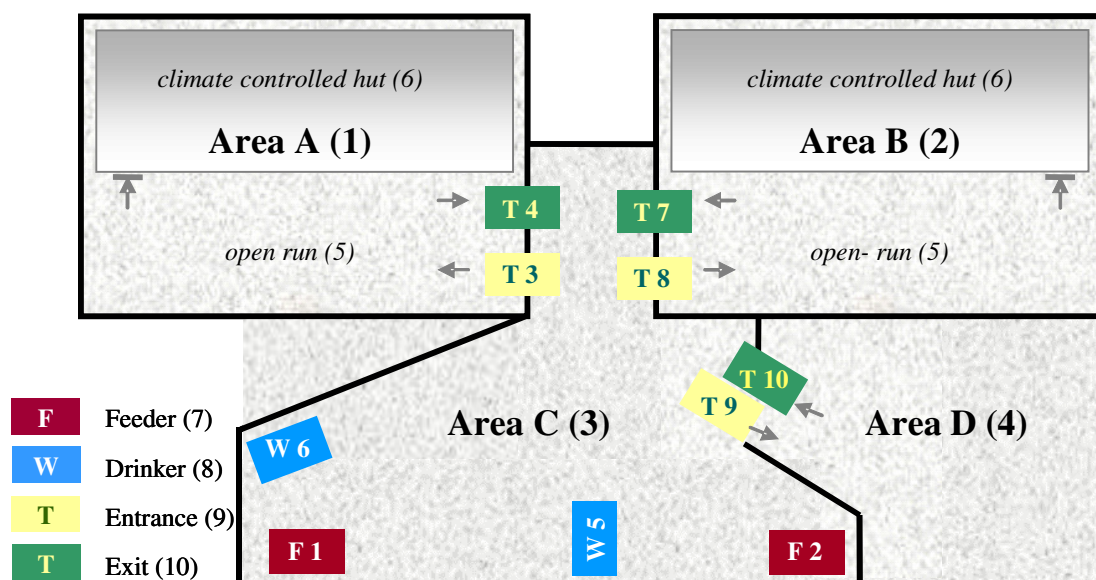


Figure 1: Experimental design

1. ábra: A kísérlet elrendezése

A terület(1), B terület(2), C terület(3), D terület(4), nyitott kifutó(5), klímaellenőrzött zárt tér(6), etető(7), itató(8), bejárat(9), kijárat(10)

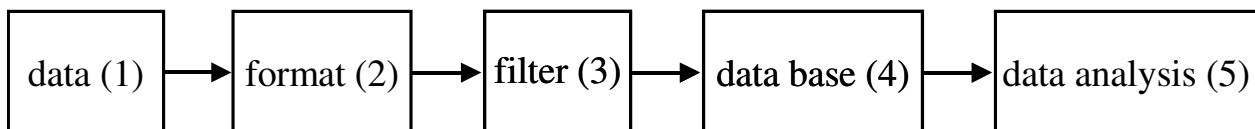


By reason of the flexible arrangement single areas were modifiable depending on different research-projects. The sensor-based registration of the behaviour was ensured by six passage gates, two automatic feeders and two drinkers. All elements were equipped with an individual electronic identification guaranteed by ear-responders.

Four areas were marked-off by the six passage gates. Each area could be reached by only one gate and abandoned by a second. Every contact with an individual identification while changing areas was assured and recorded in a data file after having been transmitted to a PC. This ensured a precise evaluation of place, duration and frequency of stay of each single pig in its housing environment during whole period of the husbandry.

### ***Evaluation criteria***

For a purposeful working up and evaluation of saved data editing and formatting of the raw data have to be done in several steps. Thereby, focused on a standardized and automated editing. Comprehensive data were too wide for an individual correction (>6000 data units per animal), and a consistent editing for following tests has to be guaranteed. After recorded data were formatted, data errors were eliminated and inserted into a database, finally. Subsequently, they were evaluated in a targeted and standardized method (*Figure 2*).



***Figure 2: Data preparation***

*2. ábra: Adat-előkészítés*

*Adatok(1), formázás(2), szűrés(3), adatbázis(4), értékelés(5)*

The aim of this evaluation was:

- Preference recording for differently designed housing methods by means of:  
visit of animals in different parts of the housing area; supported by differently designed climate areas and attachments of comfort.
- collect the affinity to elements of housing area by:  
a temporarily closing of a particular area.
- Analysis of the compensation:  
with alternative offerings.



The preference of pigs especially resulted from frequency and duration of utilisation of single areas.

Besides the described preference the affinity and compensation have to be recorded. Therefore housing environment was changed differently. Closing the access to areas and the objects which the pigs got to know before was a fundamental aspect. Through the identification gates the animals reached the closed area. In the following course these periods were named by a number. One period always starts at the same time. Information concerning the behaviour of adaptation could be evaluated by comparative analysis of frequency, sequence and duration of stay.

### ***Experimental series***

Currently following two test series are in progress.

- Comparative analysis and evaluation of the preference behaviour of pigs for normally used floors (littered, partly perforated, totally perforated).
- Analysis of the preference behaviour of pigs for attraction-material. This includes sand, litter and a special nuzzle mat.

### ***Test design concerning different floors***

In the following, housing system "A" (totally slatted floor) was compared to "B" (partly slatted floor). The totally slatted floor housing system was characterised by plastics fitted upon the floor with a slit width of 18 mm. In contrast, partly slatted floor was only half perforated. An unrestricted area with special meaning for analysis of the affinity was located between passage gates to this area and housing system. Subsequently preference behaviour was studied.

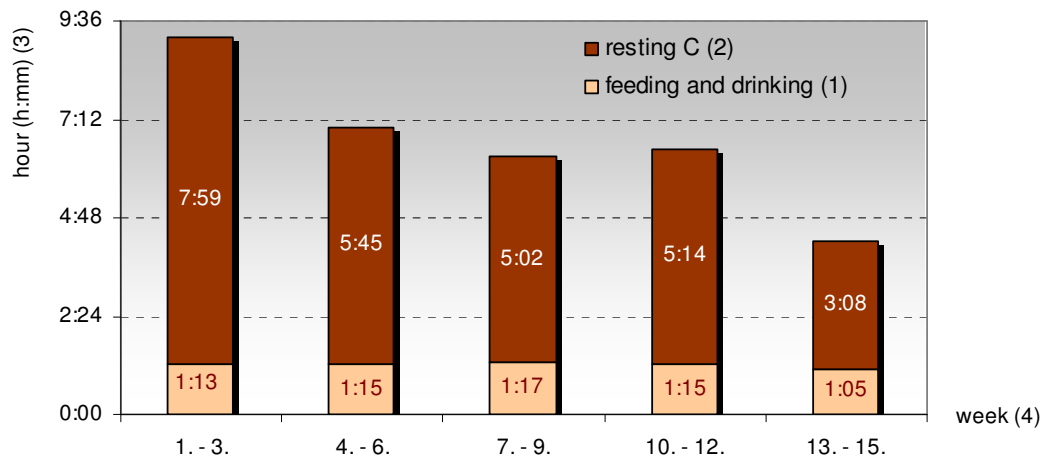
The whole fattening process of 15 weeks was divided in sections I – V (each lasting 3 weeks). During these sections animals had to choose between two housing systems (partly and totally slatted floor). Sections II and IV were characterised by only having solely access to one of two husbandry systems. Within this comparing consideration, the results of the sections I, III and V were analysed.

On September 5<sup>th</sup> 2005 21 animals were stalled with an average live weight of 25.5 kg. 15 weeks later animals have gained an average weight of 110.6 kg. The average daily gain was 817 g (s = 114 g). During the whole duration of experiment the feed conversion was 3.15 kg per kg gain. Following parameters are the average figures of the animals of one group.

## Results

### *Use of Area C (feeding and drinking)*

The duration of stay in area C contained time for feeding and drinking, as well as remaining time (Figure 3); the animals spend with waiting, resting, moving and social contacts.



**Figure 3: Feeding, drinking and resting in Area C (mean per animal and day)**

3. ábra: Táplálkozás, ivás és pihenés a C területen (átlag/állat/nap)  
táplálkozás és ivás (1), pihenés (2), óra (3), hét (4)

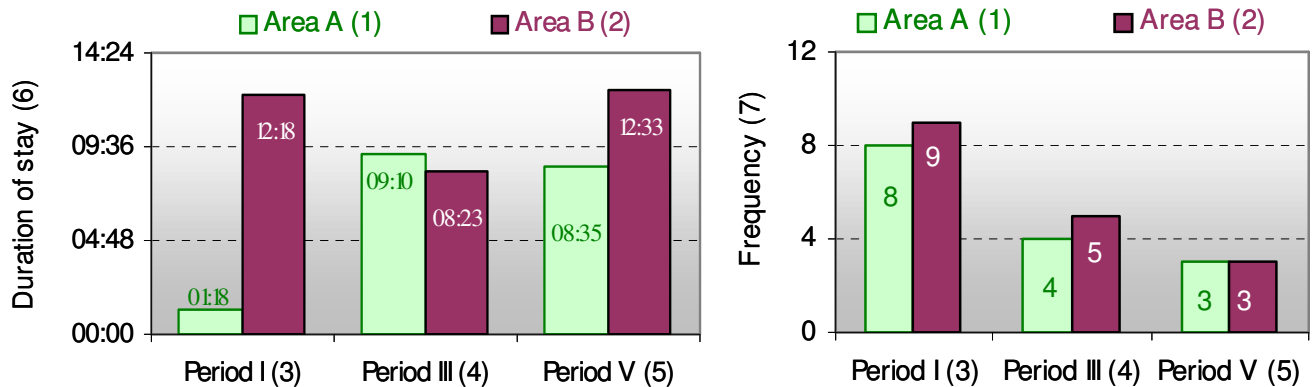
It was ascertained that animals were devouring and drinking for more than one hour daily (independent of outdoor temperature). Moreover the time spent on ingestion was not influenced by increasing quantities of food and water needed by older animals. A significant difference ( $p < 0,01$ ) could only be observed inbetween the first and the last 3 weeks. Most of the time for ingestion was spent in the middle of the fattening period, phase of strongest growth.

### *Use of Area A (totally slatted floor) and B (partly slatted floor)*

The following results concerning preference of pigs towards differently designed floors referred to periods in which both systems (A and B) were opened for the animals. These are test periods I, III and V. Figure 4 shows that the older the pigs are the faster the frequency of visits decreases, whereas duration of stay/ visit increases continuously. The duration of stay arised from 13,5 h to 21 h in both husbandry systems. At the same time average frequency per animal decreased from 17 down to 6 visits per day. For the three examined sections it could be ascertained that the average duration of stay per day in the husbandry systems partly and totally slatted floor changed. At the beginning of husbandry-period more than 70 % were spend in the two area and more than 85 % in the end of husbandry-period.



Within the periods, between the middle duration of stay in area A and B could be assessed significant differences ( $p < 0,05$ ) only for period I and V. For period III, no significant differences is assessed.

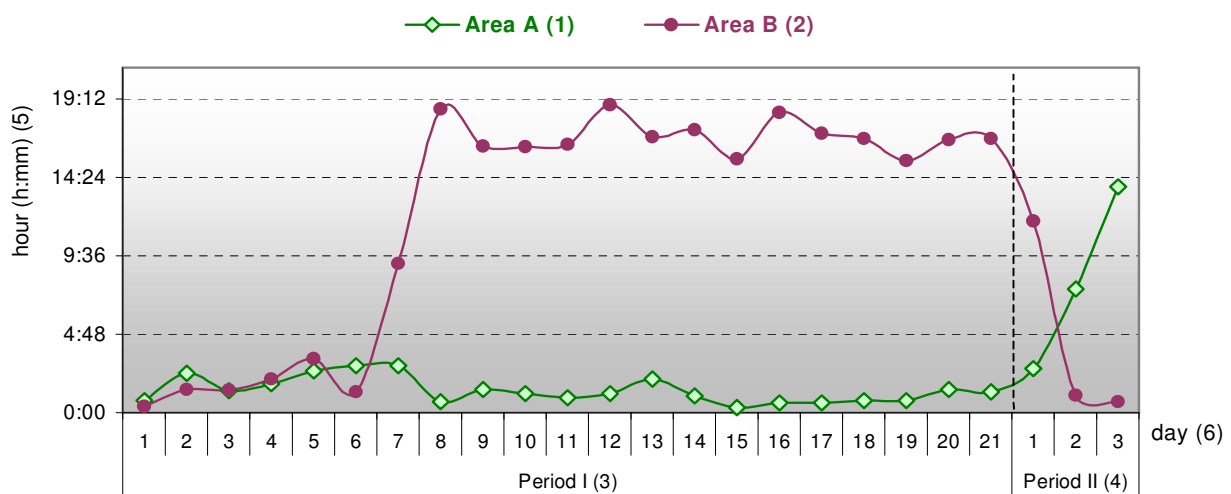


**Figure 4: Duration and frequency of stay in Area A and B (mean per animal and day)**

4. ábra: Az A és B területeken való tartózkodás hossza és gyakorisága  
A terület (1), B terület (2), II. szakasz (3), III. szakasz (4), IV. szakasz (5), tartózkodás hossza (6), gyakoriság (7)

Between the periods following situation arose: for area A, significant differences could be observed between period I and III and inbetween period I and period V ( $p < 0,05$ ) and for area B, significant differences between periods III and period I and between period III and period V ( $p < 0,05$ ) could be demonstrated.

In period I (1<sup>st</sup> up to 3<sup>rd</sup> week) animals showed their clear preference (Figure 5). Obviously the animals showed a clear preference for the partly slatted floor beginning from sixth day in period I. Within the first six days of experiment no preference for any system could be shown.



**Figure 5: Development of the duration of stay in period I (mean per animal and day)**

5. ábra: A tartózkodási időtartam alakulása az I. időszakban (átlag/állat/nap)  
A terület(1), B terület(2), I szakasz(3), II. szakasz (4), óra (5), nap (6)





Period III (7<sup>th</sup> up to 9<sup>th</sup> week) is characterised by pigs not having the opportunity to visit the partly slatted floor during the section before (Figure 6). It lasted 6 days until pigs noticed partly slatted floor was reopened again. During following week (7. to 15. day) animals show a balanced preference. It became obvious that animals prefer partly slatted floor again. Contemplating the whole section, however, there was no clear preference for any system.

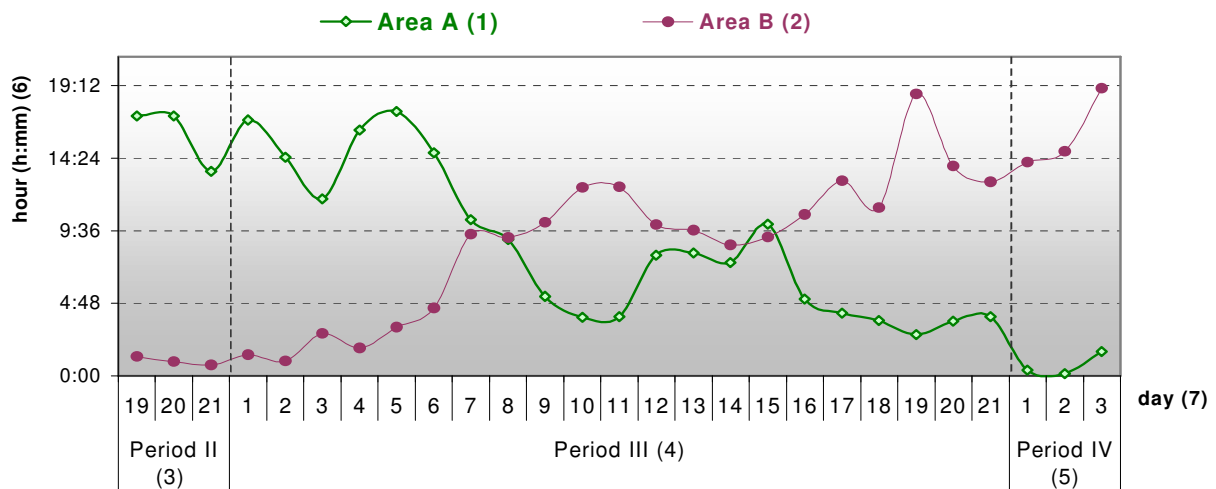


Figure 6: Development of duration of stay in period III (mean per animal and day)

6. ábra: A tartózkodási időtartam alakulása a III. időszakban (átlag/állat/nap)

A terület(1), B terület(2), II szakasz(3), III. szakasz (4),IV. szakasz (5), óra (6), nap (7)

After having reopened the access to totally slatted floor during section V (13<sup>th</sup> to 15<sup>th</sup> week) no clear preference for a particular husbandry system could be noticed (Figure 7).

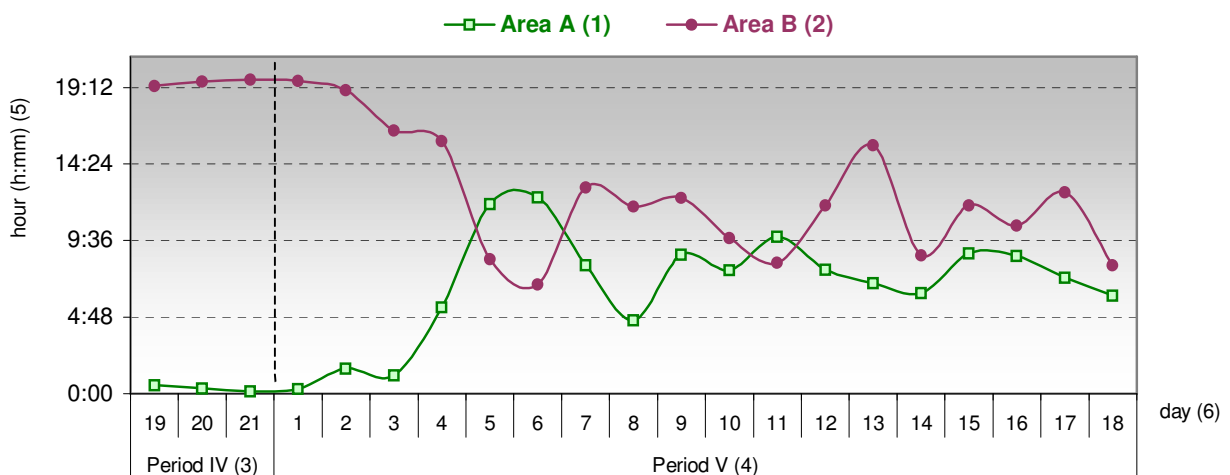


Figure 7: Development of the duration of stay in period V (mean per animal and day)

7. ábra: A tartózkodási időtartam alakulása az V. időszakban (átlag/állat/nap)

A terület (1), B terület (2), IV.szakasz (3), V. szakasz (4), óra (5), nap (6)



## Discussion

### *Use of Area C (feeding and drinking)*

The results showed that a single day is divided into relatively small and definite time-units of feeding and resting. Time spent for feeding during the fattening period was constant, moreover fluctuates within narrow limitations. 85 % of 8-11 h lasting activity-time per day wild boar spent with foraging and feeding (Briedermann, 1990). Dependent on provided food animals have spent between 10 minutes and 9 hour with feeding. There was a close connection between feeding and locomotion/exploration. As opposed to this, animals grown in an intensive husbandry showed shorter feeding phases.

From week 7 up to week 9 (time of intensive growth) most of the time animals feed (1:17 h per animal/per day). Shortest time spent with feed (1:05h per animal/per day) was studied during last part of fattening process (week 13 – 15). During this period speed of feeding has increased. *Stuhec et al* (1992) have observed an average duration of feeding of 140 minutes per day (ad libitum) whereas feeding time of older animals was shorter by conducting two tests on slatted floor

### *Use of Area A (totally slatted floor) and B (partly slatted floor)*

In this experiment the animals could decide according to their natural needs, which type of housing lying area respectively they do prefer.

The results showed that the preference of pigs for a particular lying area changed with increasing age. A clear preference for partly perforated surface during first section was observed. A higher heat loss by the totally slatted floor could be a reason for the enhanced preference of certain aged pigs. Obviously, older pigs became less sensitive concerning surface consistency, older pigs did not show a clear preference for one system.

In respect of the frequency of visits the different housing areas, a continually reduction could be determined. A strong correlation between the frequency of visit and duration of stay could be studied.

Obviously, younger animals were more active than older animals. Moreover they changed their habitation more often. Pigs with increasing age were increasingly inactive, because older pigs showed fewer action despite the same duration of stay.

On average animals spent more than 70 % of the day in A and B. The results were comparable to results described in literature. Due to *Marx* (1991) and *Sambraus* (1991) pigs lay during 80 % of the day. Therefore this was the most common behaviour which is attributed to the poor animations in today's stalls and the resulting boredom.



## **Conclusions**

Sensor-based system enables a continuous registration of behaviour of pigs during whole duration of housing, moreover continuous registration of changes in behaviour of each single pig. The preference towards different housing systems is illustrated as a function of time (duration of stay and period).

The studies concerning preference for partly slatted floor or totally slatted floor showed a changed preference during the life of pigs. Whereas young pigs showed a preference for partly slatted floor, as opposed to older animals, no clear preference could be noticed.



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