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THE USE OF INFRARED VIDEO TECHNIQUE AND COMPUTER SUPPORTED ANALYSIS IN INVESTIGATIONS OF RABBIT BEHAVIOUR

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ABSTRACT

Infrared (IR) video technique in combination with the OBSERVER/Video Tape Analysis System is a method to record behaviour of rabbits continuously over 24 hours to calculate statistics of behavioural parameters with pertinent computer software. The method is applicable to measure feeding, resting and suckling behaviour as well as other ethological parameters. Rabbit does show a high frequency of feeding and drinking in 24 hours (62.6, 42.6 resp.) and they use - if possible - an elevated seat for laying and crouching at 30.4, 23.9 % resp. of total laying or crouching time.

INTRODUCTION

Rabbits are dusk and night active animals (HUDSON and DISTEL 1989; JILGE 1991). In behavioural investigations of rabbits during the night artificial light was used up to now (KRAFT 1976; WULLSCHLEGER 1985; WIESER-FROELICHER 1986; BIGLER und LEHMANN 1991; HOY 1997). But, light-dark-change is a zeitgeber (timer) for biorhythms (ASCHOFF 1954). SEITZ (1997) found a highly significant relationship between dusk or dawn and suckling and WASSERZIER et al. (1997) demonstrated a rise in number of nest visits of rabbit does around the change from day light to darkness et vice versa. The activities of rabbits follow a biphasic circadian rhythm (STAUFFACHER 1988). So, use of visible light to control rabbits behaviour by direct or video observations can lead to alterations in circadian periodicity up to behavioural disturbances. In addition the presence of observer can influence behavioural patterns of rabbits (SEITZ 1997).

The use of infrared video technique opens the possibility to observe rabbits in darkness not influenced by persons or artificial light. In combination with a time lapse recorder and computer supported analysis observations over 24 hours are possible and very effective.

MATERIAL AND METHODS

Infrared video observations demand a specific camera configuration (Tab. 1). With an infrared camera behaviour of rabbits can be videotaped in complete darkness. Infrared (IR) lamp WFL-I-LED 30 W emits infrared light with a wave length of 880 nm. Ability of vision in rabbits under dark adaptive conditions is similar to human beings. Highest sensitivity is at a wave lenght of 511 nm (BROWN 1936).

Table 1: Configuration of Infrared video technique

- IR camera WV-CD 810/G or WV-BP 500 (Panasonic)
- Time lapse video recorder (VCR) AG 6024 HE (Panasonic)
- IR lamp with power equipment WFL-I-LED 30 W (λ = 880 nm)
- Monitor WV-BM 80 (Panasonic), Video tapes VHS 180 min

With a time lapse recorder 180 min video tapes can be prolonged to 24 hours recording time without having to change the cassette. OBSERVER/Video Tape Analysis System VTA (Noldus, NL) was used to evaluate behavioural patterns of individuals or groups of animals (Tab. 2).

Table 2: Configuration of OBSERVER/Video Tape Analysis System

- Computer (minimum 486 DX 2/66 Mhz, 16 MB RAM)
- OBSERVER/Video Tape Analysis System (Noldus, NL) with programme options

  Event recorder, Time-event table, Time-event plot, Descriptive statistics, Nested analysis, Lag sequential analysis, Reliability statistics, Export to other programmes (e.g. Excel, SPSS)
- Video recorder AG 5700 (Panasonic)
- Time code generator AEC Box 18/28

Either at recording or during copying the video tape time code (from second 1 to second x) is placed on the tape by the time code generator AEC Box 18/28. From a specific VCR (AG 5700, Panasonic) the recordings will be sent to computer together with time code. With the „Event recorder„ of the OBSERVER/VTA software it is possible to define behavioural patterns and to mark start and finish of events with keyboard keys (e.g. key f = feeding, key d = drinking, key a = activity). The finishing time of one pattern is the starting time of the next behavioural pattern. The actual duration of the behaviour is indicated by a converted time axis (time code – see TIME, ACTOR and BEHAVIOUR in Fig. 1). Beginning and end of the analysis can be defined by TIMERS (left top in Fig. 1). The rewind option of OBSERVER/VTA enables the inclusion of additional informations into programme or the correction of mistakes made at first data input.

Evaluations of behavioural observations are conducted in the option „Elementary statistics„ of the programme. Data are saved to a file. The following parameters can be calculated for the whole period of observation or for specific intervals (e. g. during darkness) for every individual or for a group of animals: frequency of defined behavioural patterns, mean duration, minimum, maximum and standard deviation of different behavioural patterns, total time of behavioural pattern in 24 hours (or in chosen interval) and percentage of occurence of this pattern in selected observational period (e. g. 24 hours, night period). Results are given in table (Fig. 2).
Graphic presentation (Time-event plot) supports output of data. Additionally the programme gives the possibility to include influences from the environment or from other animals (modifier), to lag sequencies of behavioural patterns (Lag sequential analysis) and to compare the results obtained by different persons (reliability analysis). Data export of observations is possible to other statistic or graphic procedures like SAS, SPSS, PowerPoint, dBASE, Excel, Lotus.
IR video technique in combination with OBSERVER/Video Tape Analysis was used in our own investigations of feeding behaviour of rabbit does kept in 5 flatdeck cages measuring 50 x 60 x 45 cm (width, depth, height) with plastic slatted floor (see Fig. 1 – right top). 5 does of White New Zealand breed (NZW) were observed during suckling period (2nd and 3rd parity). Does were kept under artificial light regime with 12 hours light (from 5 a.m. to 5 p.m.). Frequencies of using different areas of a traditional concrete keeping cage by does were also investigated. Does were fed ad libitum a standard diet of pellets from feeding automates. Water supply was given by nipple waterers.

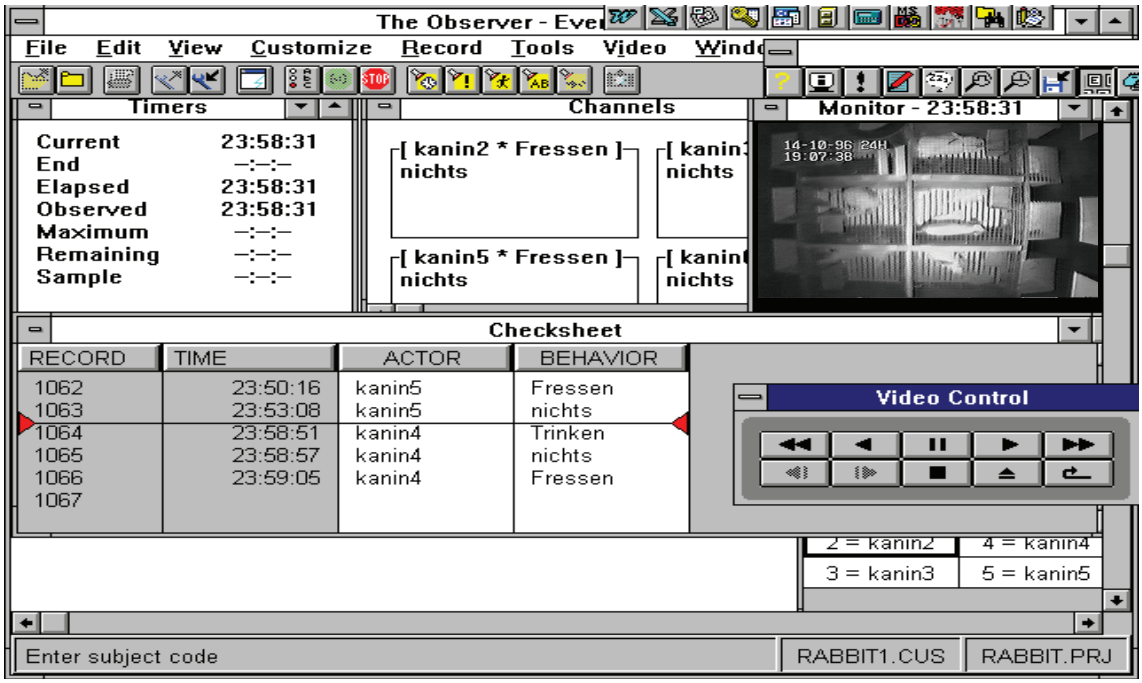

Figure 1: OBSERVER/Video Tape Analysis System – „Event recorder“

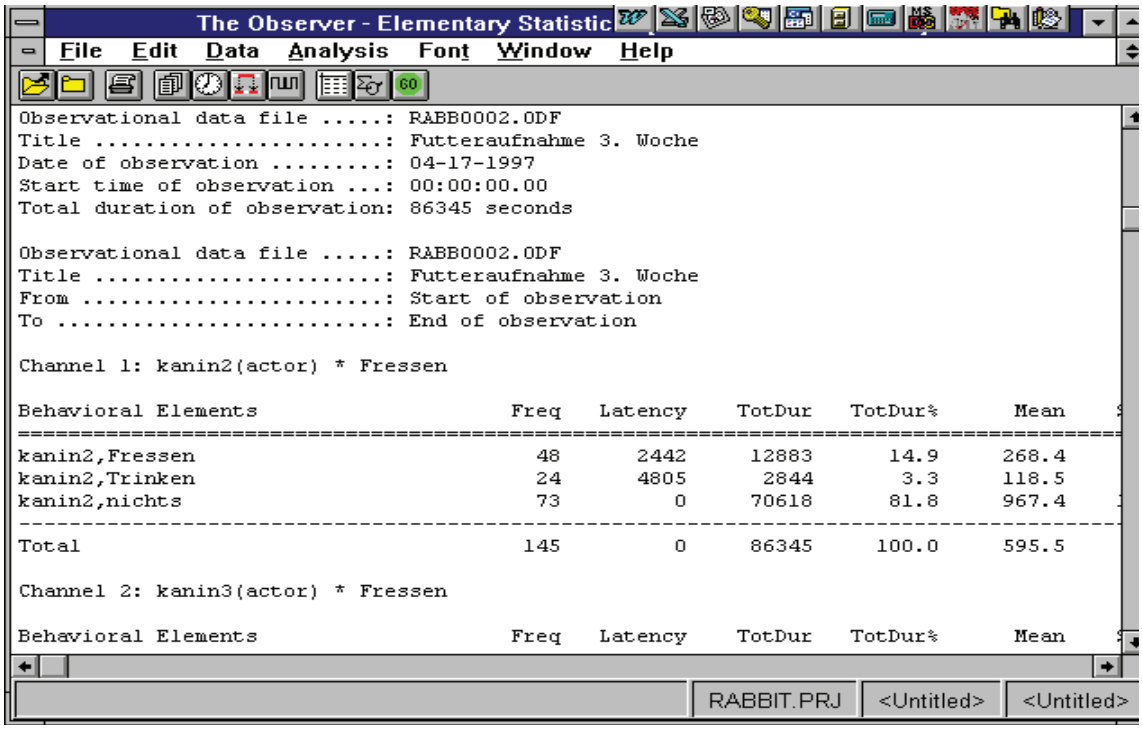

Figure 2: Elementary Statistics of OBSERVER/VTA (example)

In 4 concrete cages measuring 80 x 60 x 60 cm (width, depth, height) does were kept on straw under natural lighting conditions during spring and summer. 4 does of NZW with 1st parity were evaluated. By opening a side wall a second cage with elevated resting place was usable by doe and/or siblings. All does were introduced in the cages before mating (one doe per cage). A total number of 660 times 24 hour-observations during the suckling period were observed. Statistic analysis was performed with SPSS for windows (Student-Newman–Keuls

Test, Chi–Square Test), to compare different behavioural patterns of rabbit does on the basis of longlasting IR video observations (SEITZ 1997; WASSERZIER et al. 1997; SELZER and HOY 1999).

RESULTS AND DISCUSSION

Investigations showed that rabbit does had an average frequency of 62.6 feeding periods (concentrated food) in 24 hours. Mean duration of a single feeding event was 230 seconds with a very wide variability from 5 to 1069 seconds. An average of 16.0 percent feeding time in 24 hours was calculated (Tab. 3). The finish of one feeding event was characterized by leaving the feeding automat or by end of chewing. This was distinctly visible on the screen.

Frequency of drinking (42.6 times in 24 hours) was lower than frequency of feeding. Staying at nipple waterer was shorter (on average 72 seconds per drinking resp. staying at nipple waterer). Unlike feeding behaviour drinking could not be distinguished from licking at nipple waterer by video technique. So, we have defined this behavioural pattern as „staying at nipple waterer„. Does spent 3.3 % of 24 hours staying at the nipple waterer. No differences in the frequency of feeding and drinking were found between night and day. But, individual differences between rabbit does were great (from 44 to 80 times feeding and 20 to 71 times „drinking„ in 24 hours). Also, the duration of staying at nipple waterer showed a large variety - from 1 to 885 seconds - similar to feeding behaviour.

Table 3: Statistics of feeding and drinking behaviour of rabbit does in 24 hours

	Frequency	Percentage in 24 hr (%)	Mean (sec)	Minimum (sec)	Maximum (sec)
feeding	62.6	16.0	230	5	1069
drinking *	42.6	3.3	72	1	885

* staying at nipple waterer

In a second experiment rabbit does were allowed to use the neighbouring cage and an elevated seat for resting. Does kept in these enriched traditional concrete cages spent 39.5 percent in 24 hours laying and 9.2 percent crouching (Tab. 4).

Table 4: Percentages of laying and crouching of rabbit does in different areas of traditional concrete cages

Behavioural pattern	Percentage in 24 hours (%)	among them in the same cage like pups (%)	among them in the other cage like pups (%)	among them in the other cage like pups on elevated seat (%)
laying	39.5	49.6	20.0	30.4
crouching	9.2	31.5	44.6	23.9

The does spent half of total laying time (total laying time = 39.5 % of 24 hours) in the neighbouring cage (20 plus 30.4 %). The elevated resting place was used for laying at one third (30.4 %) and for crouching at 23.9 % of the respective behavioural parameters. It can be concluded that animal welfare would be improved by enlargement of cage size and by elevated resting seats especially for large breeds in traditional keeping systems. Other investigations have shown that rabbit does under intensive keeping conditions in get-away-cages have likewise used elevated seats at appr. 50 percent in 24 hour periods (SELZER and HOY 1999).

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