International Society for Applied Ethology: the 32nd Nordic region winter meeting

26 – 28 January 2022

Learning and Anthrozoology - with a hint of social behaviour

Swedish University of Agricultural Sciences, SLU
Department of Animal Environment and Health

Rapport 58, 2022
ISSN 1652-2885
ISBN 978-91-576-9951-0

Proceedings of the 32nd Nordic region winter meeting of the International Society for Applied Ethology

Editor:	Therese Rehn & Lena Lidfors, Swedish University of Agricultural Sciences, Department of Animal Environment and Health
Publisher:	Swedish University of Agricultural Sciences, Department of Animal Environment and Health
Year of publication:	**2022**
Report number:	**58**
ISSN:	**1652-2885**
ISBN:	**987-91-576-9951-0**
Place of publication:	**Skara, Sweden**
Illustration:	Pixabay

Preface

Welcome everyone to this 32nd winter meeting of the Nordic region of the International Society for Applied Ethology (ISAE).

The plan was to have this meeting at SLU:s Ultuna campus in Uppsala, but the Covid-19 pandemic that started in March 2020 in Sweden is still prevailing during January 2022. We therefore had to change it to a digital meeting. The positive thing is that one day before we start the meeting 64 researchers, PhD students Master students and representatives from animal welfare and farmer organisations have registered.

The theme for this Nordic ISAE Winter Meeting is learning and anthrozoology, with a hint of social behaviour. These three areas are placed as separate sessions and we asked those who wanted to present to aim for these subjects. Still we have a large section of free papers showing the width of the area of applied ethology in research.

During the ISAE meeting there will be four plenary talks from invited speakers on theories on associative learning, social behaviour in teleost fish, human-animal relationships in farm animals and 3Rs and animal behaviour. In total, 26 shorter presentations is also included in the program. Plenary speakers get 30 minutes to present and 10 minutes for questions and discussions. Presenters of shorter talks have 15 minutes to present and 5 minutes for questions. Poster presentations have not been an option for this meeting.

The meeting has been advertised through the web page of the Department of Animal Environment and Health (SLU) and have been up-dated at regular times. We thank Gunilla Jacobsson for an excellent help with this important task. A small fee of 50 Euros for ISAE-members and 80 Euros for non-members is charged to cover expense for work with the web page, the Proceedings and for planning of the meeting.

We hope this Nordic ISAE Winter Meeting will be an inspiring research event and that networking will work even though we are meeting over the internet.

The organisation committee,
Lena Lidfors, Anna Lundberg, Therese Rehn, Anette Wichman, Elin Hirsch, Lena Skånberg

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Programme

26 January	Program	Presenter
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13.10-13.50	**Plenary talk:** New theories of associative learning	Magnus Enquist
13.50-14.10	Behaviour predicts responses in a cognitive judgement bias test in cattle	Linda Keeling
14.10-14.30	Short-term memory in horses - a practical study	Karin Morgan
14.30-15.00	*Coffee break with break-out rooms and Menti questions 2, 3*	
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15.00-15.20	Dairy cows did not rely on social learning when solving a spatial detour task	Johanna Stenfelt
15.20-15.40	Making the most of life - the effects of the early environment on later behaviour in laying hens	Lena Skånberg
15.40-16.00	The role of associative learning in stereotypic behaviour - a computational approach	Vera Vinken
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16.10-16.30	Improved methods for stunning of pigs with foam; effects of repetition and scent on pig reaction to foam	Miranda Blad
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16.50-17.10	Information from ISAE	Marko Ocepek
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27 January	**Program**	**Presenter**
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10.00-10.20	A calm companion lowers fear in groups of dairy cows	Maria Vilain Rørvang
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11.50-12.00	Closing of Nordic ISAE meeting *and Menti question 9*	Lena Lidfors et al.

PLENARY: New theories of associative learning

M. Enquist

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Insights into learning processes are fundamental for understanding many aspects of animal behavior including issues in applied ethology such as behavior disorder and management of animals in captivity. However, gaps in our theoretical understanding of learning mechanisms, and how they are connected to other mechanisms and inborn predispositions, have often prevented progress. Recent advances in machine learning have provided us with new powerful mathematical models of associative learning processes that for instance explain how productive behavior sequences can be efficiently acquired. These developments, which were directly inspired by theories of Instrumental and Pavlovian learning, are now being adapted to learning in animals. I will present these new models and insights, and discuss how they may significantly advance our understanding of learning mechanism and their evolution, and how learning processes can be integrated with decision making, motivational processes and inborn factors.

Behaviour predicts responses in a cognitive judgement bias test in cattle

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Observations of anticipatory behaviour and choices to ambiguous cues in a cognitive judgement bias (CJB) test have been suggested as possible methods to assess welfare. In this study we observed the body posture and movements of cattle in the start box before the gate opened into a runway and they could choose to approach (or not) a rewarded or unrewarded bucket. Our assumption was that behaviour before a rewarded bucket, or in more optimistic individuals, could be used to identify potential indicators of positive emotional state. We used four dairy cows and four heifers (two positive and two negative individuals of each age category). The classification to positive or negative individuals was based on their relative performance of positive and negative social interactions in their home pens, compared to other members of the herd. We have preliminary evidence that the positive individuals were more optimistic in the CJB test. Perhaps not surprisingly all individuals were facing the bucket more often ($F=4.46$, $P=0.03$) in anticipation of being tested with a rewarded bucket (mean±SE: 0.39±0.09) compared to a non-rewarded (0.16±0.06). There was a tendency ($F=3.04$; $P=0.08$) for an interaction between whether the individual was classified as positive or negative and the frequency of behavioural transitions before being tested with the different buckets. Positive individuals showed a similar number of transitions before the rewarded (0.41±0.07) and the unrewarded bucket (0.38±0.06) possibly associated with them being more optimistic. Negative individuals showed more transitions prior to an rewarded bucket (0.33±0.06) than an unrewarded bucket (0.16±0.04), possibly reflecting positive anticipation even in a generally more pessimistic individuals. The result support the importance of behavioural transitions as an indicator of positive anticipation. These results also suggest that observations in the home pen may be used to identify optimistic and pessimistic individuals, but this would need further confirmation.

Short-term memory in horses – a practical study

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It is important to understand the function of the memory when handling and training horses so the handler can facilitate the learning process. Today it is known that horses have a well-functioning long-term memory, but less is known about the short-term memory. The aim was to investigate the short-term memory of the horse, focusing on age and gender. We used a Y- maze to investigate the short-term memory. Twenty horses of different gender and age were tested in their ability to recall a feeding event in one of two buckets. The horses were divided into four groups of five individuals each: older mares (13-15 years), older geldings (14-18 years), younger mares (3-5 years) and younger geldings (4-5 years). The horses were released immediately after the food delivery or after a delayed release that was 3-18 seconds long. All tests were carried out for one day. All 20 horses performed five trial each (one for each time interval), that resulted in a total of 100 releases. The results were analyzed by using a significance test (Chi2) comparing the rate of success between groups. The results showed that the rate of success was on average 54%. There was no significant difference neither between the younger and older horses ($p=1.0$) nor between the mares and geldings ($p=0.68$). We concluded from this study that there was no difference in the horses' short-term memory based on their gender or age. Further studies are required to enable a concrete answer to be given on how the short-term memory affects the horse's ability to learn and how this will affect the way of training of a horse.

Dairy cows did not rely on social learning when solving a spatial detour task

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Animals can acquire new behaviors through individual and social learning. Individual learning occurs through an individual's own experience of trial and error, whereas social learning is influenced by observing or interacting with other individuals. This study aimed to investigate if dairy cows possess the cognitive abilities to acquire new behavior through intra-species social learning in a spatial detour task. In a detour task, the animal must navigate around an obstacle to reach a reward. The information transfer between conspecifics can be studied by allowing an animal to observe a trained demonstrator performing the detour task. Thirty-four dairy cows participated in the study, of which two were selected as demonstrators and trained to follow a human handler along a demonstration route. The remaining 32 cows were divided into two groups balanced according to age and breed, which were then randomly assigned as either observers of demonstration (n=16) or controls not observing demonstration (n=16). All test subjects were given three trials to solve the detour task (max duration per trial: 90 sec). Response variables were success, latency to reach the reward, concordance in route, and time spent facing the test arena before trial (i.e. during demonstration). Analyses were done on first trials and all three trials separately. The study found no significant differences in success or latency between observers and controls, although observers spent a greater proportion of the time before trials facing the test arena than controls did. Concordance in route was low for both treatment groups, meaning that both observers and controls were inconsistent in their choice of side to detour. The results indicate that cows did not utilize social learning mechanisms when solving a spatial detour task. In practice, this means we cannot expect cattle to learn how to navigate barriers solely by watching other cows doing so.

Making the most of life - the effects of the early environment on later behaviour in laying hens

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Early experiences can impact individual's abilities to make the most of future opportunities by affecting exploration, spatial skills and learning. This study aimed to identify specific environmental inputs during rearing that could promote these traits. During Early-rearing (Day 1-Week 4), 364 one-day-old laying hen chicks (16 pens) were housed in one of two environments; "Multi-Choice" (four litter and perch types) or "Single-Choice" (one litter and perch type). During Mid-rearing (Week 5-15), half of the groups changed to the opposite environment, resulting in four treatment combinations. At Week 16, all groups were moved to standard laying pens. Birds' responses were assessed in behavioural tests offering opportunities to find mealworms and from video recordings following transfer the laying pens. A Hole-board Habituation Test (Week 9-10) was carried out in a novel arena with birds alone or in groups of three. Repeated Challenge Tests (Week 14 and 17) were carried out in the home pen at the group level. Birds with "Multi-Choice" during Mid-rearing ate proportionally more mealworms in the behaviour tests compared to "Single-Choice" birds ($P<0.05$, GLM). Across all treatment combinations ($P<0.05$, GLM) except that in which the birds had "Multi-Choice" in both rearing periods, fewer mealworms were eaten during the Hole-board Habituation Test when tested alone vs in a group. Irrespective of their Mid-rearing environment, birds with "Multi-Choice" during Early-rearing tended to use the perches sooner ($P=0.06$, Kruskal Wallis), and to lay eggs at higher locations ($P=0.06$, Kruskal Wallis), after transfer to the laying pens (Week 16-27) whereas birds with "Single-Choice" in both periods were slower to move and explore the laying pen ($P<0.05$, GLM). In conclusion, providing variation within resource types is a straightforward way to increase environmental complexity and this early input boosted birds' abilities to gain rewards and use novel resources.

The role of associative learning in stereotypic behaviour – a computational approach

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Stereotypic behaviours, historically described as 'repetitive, unvarying sequences of movements without any obvious goal or function', can be detrimental to the health and welfare of captive animals. Since these behaviours are repetitive and persistent over time, it is likely that internal or external reinforcement plays a role in their development. Furthermore, it has been suggested that learning processes, such as the formation of stimulus-response links, may play a role in the repetitiveness of stereotypic behaviour. These findings have led us to consider associative learning as an important element in the development of stereotypic behaviour. In this study, we explore whether associative learning theory could serve as a theoretical tool for modelling and simulating the development of stereotypic behaviour. To do so, we adapted existing models of associative learning to an animal behaviour framework. Subsequently, we formulated four examples that investigate how associative learning can be used to model stereotypic behaviour. These models include the following key components: a captive environment different from the animals' natural one, inborn predispositions, internal factors including motivational processes and associative learning processes. Each of the four models focuses on exploring the role of either inborn predispositions, sequences of stimuli, shared stimulus elements or motivational processes in the development of behavioural disorders. Our preliminary simulations show that associative learning in combination with genetic predispositions can help explain how stereotypic behaviour arises. In conclusion, these explorative models suggest that the role of associative learning, and specifically sequential learning, should be incorporated in further research on how stereotypic behaviour develops and persists in animals.

Improved methods for stunning of pigs with foam; effects of repetition and scent on pig reaction to foam

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A method researched for stunning of pigs is nitrogen filled high expansion foam. In previous studies questions have arisen as to how aversive the pigs find the foam. The aims of this study were to investigate if the pigs' behaviour were altered when scent was added to the foam, and if repeated exposure to non-scented air-filled foam would affect the pigs' behavioural reactions. The study included 50 pigs (14-16 weeks of age), 30 in one group with vanilla scented air-filled foam, and 20 in the group that were exposed to a non-scented air-filled foam on three consecutive days. The first day of exposure to foam in the group of 20 pigs was also used as a control for the study with added scent. When pigs were exposed to scented foam, they explored the foam and walls more than pigs exposed to unscented foam. They also showed an increased activity. When the pigs were exposed to foam on three consecutive days there was an increase from day one to three in vocalising behaviour, both in forms of grunts and screams/squeals. There was also a slight increase in the number of escape attempts. Furthermore, increased exploration of the walls and decreased exploration of the floor was seen with time. The results indicate that it is possible to increase the pigs' interest in the foam by adding a scent to it, and there are no indications that a foam with added scent increases stress or anxiety. However, further research is needed to confirm that an increased interest in the foam is in fact correlated with lowering of stress or anxiety in the pig. The results also indicate that even though the pigs do not seem to get completely used to the foam when exposed to it on repeated days, their aversive behaviours do not increase either.

Walk the line – how cows navigate an obstacle course under dim and bright light conditions

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Animal welfare legislation often requires lighting at night for cows in loose housing systems. In practice, this commonly entails turning off sections of the light fixtures to create a dim light environment. On the commercial side, red light has been recommended as a night light in cattle housing to facilitate livestock supervision. Neither the effect of red light nor the effect of partial night lighting on cow movement has been scientifically investigated. We therefore studied dairy cows' ability to navigate through an obstacle course under different light intensities, colors, and light distributions. In a change-over study, 12 non-lactating dairy cows were encouraged to pass through an obstacle course under 14 different light treatments, including white or red light and even or uneven light distribution. Each cow walked through seven different, randomized obstacle courses a day for four days, starting with one run in bright white light (260 lux), followed by one run in darkness (0 lux). Thereafter, three runs in three randomized light treatments, with 10 min in between treatments to adapt to each lighting condition. Heart rate, measured before and after the obstacle course, did not differ between treatments. The walking rate was similar in bright white light and darkness, though the number of steps increased, and the step length was shorter ($p<0.05$) in darkness compared to in bright white light. In uneven red dimmed light, cows spent the longest time in the obstacle course ($p<0.05$). In conclusion, cows walked with shorter steps but at a similar speed in darkness compared to bright white light. The speed was slower when the light distribution was uneven compared to the other light treatments, indicating that the cows moved more hesitantly in uneven light.

PLENARY: Dominance hierarchies in teleost fish – behavioral and neuroendocrine effects of social rank

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The development of dominance based social hierarchies is common and an individual's rank within this hierarchy greatly affects, behaviour, development and physiology. Low ranking animals are subjected to stress and typically show submissive behaviour and a general behavioural inhibition. Dominant animals on the other hand are aggressive, active and highly competitive, monopolizing resources in demand, e.g. food, mates, shelter etc. Social rank is determined by pairwise agonistic interactions and in addition to the genetic influence on aggressive behaviour competitive ability is also determined by social factors and previous experience. Subordinate animals appear to do the best of a bad situation by inhibiting their behaviour to avoid aggression from the dominant while waiting for better times to come. However, when given the opportunity low ranking individuals must be able to switch from a submissive to a dominant behavioural state. This switch involves changes in hormonal signalling, brain transcriptome profiles and changes in the activity of various neurotransmitter systems. The brain monoamines, i.e. dopamine, norepinephrine and serotonin (5-hydroxytryptamine, 5-HT), have been suggested to act as neuromodulators with effects on the neural network controlling social behaviour. During fights for social dominance the brain 5-HT system is rapidly activated in both winners and losers. However, as the dominance hierarchy is established brain serotonergic activity in winners, animals becoming socially dominant, gradually returns to control levels whereas losers, animals becoming subordinate, continue to show elevated brain serotonergic activity along with elevated plasma cortisol concentrations. In the established dominance hierarchy subordinate animals show a general behavioural inhibition. The chronic elevation of brain serotonergic activity is likely to be part of the mechanism mediating this behavioural inhibition.

Horses' behaviour on pasture and in an open barn

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Open barns are found in about 20% of the Swedish horse farms where all, or some horses are kept in groups, and the trend shows an increasing number of open barn systems. Keeping horses in an open barn enables the horses to increase their social contact leading to improvement of welfare. The aim was to study a group of horses both on pasture and in an open barn. The questions were do their social contacts and behaviour differ between pasture and an open barn? Seven horses were observed on pasture during three days in July and during four days in September/October in an open barn. Observations were done in two sets á three hours each day. Every 15 minutes each horse location was registered including activity and closeness to another horse (alone>5m from another horse, in pair or in a group). The behaviours registered were foraging; stand; walk; trot/canter; standing rest; insect control; allogroming; play. Data were analysed using One Way Anova on Ranks. Comparing the time-budgets showed that the horses foraged more in the open barn than on pasture (47% of observations resp. 27%, p=0.001). No behaviour related to insect control was observed in the open barn. These differences can be due to warmer weather on pasture leading to more insects and that the horses on pasture grazed during late evening and early morning. This is supported by the observations that the horses spent more time around the waterhole during 12-15 PM and more time on grass 17-20 PM. The horses were close to the other horses for most of the time on both pasture and in the open barn. The conclusion is that keeping horses in an open barn seems to be comparable to keeping horses on pasture regarding behaviour and social contacts.

A calm companion lowers fear in groups of dairy cows

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Dairy cows are generally docile, but some on-farm procedures can result in fear reactions, which can make cattle dangerous to handle. Fearful cattle are not only a threat to human safety, but also to animal welfare and productivity. This study investigated if fear in groups of dairy cattle could be attenuated by the presence of a calm companion. Twenty-seven dairy cows participated in the study, and the chosen fear-eliciting stimulus was: three sudden, repetitive openings of a red and white umbrella. Nine older demonstrator cows were selected as either untrained (i.e. habituated to the presence of the test person, n=6) or trained demonstrators (i.e. additionally habituated to the fear-eliciting stimulus, n=3). The remaining 18 cows comprised six test cow groups, which were their own controls, resulting in a cross-over design; 3 groups were tested with a trained demonstrator first, then with an untrained demonstrator, and vice versa for the other 3 groups, resulting in totally 12 tests (4 sub-treatments). Response variables were heart rate increase from baseline, behavioural reaction, and latency to resume feeding after being exposed to the fear-eliciting stimulus. Behavioural reactions were analysed in an ordinal mixed-effects model, latencies and heart rate were analysed in Mixed-effect models for normal data, and a post hoc analysis was done to elucidate any potential carry-over effect between sub-treatments. The study found a calming effect of the companion on the test cows' heart rate ($F_{df}=4.601$, $p=0.047$), but not on latency to resume feeding ($F_{df}=1.711$, $p=0.24$), or behavioural reaction (estimate±se=-0.82±0.69, $p=0.19$). The post hoc analysis revealed a carry-over effect on latency (multiple pair-wise comparisons, $p<0.05$) indicating that test cows tested with an untrained demonstrator first, had longer latencies than all other sub-treatments. Adding a calm, experienced cow to groups of dairy cattle may mitigate fear and thereby improve welfare and safety.

Awaiting gate-opening? Preliminary descriptions of cow-calf behavioural responses to separation in a cow-driven cow-calf contact system

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As an alternative to early separation of the dairy cow and calf, we investigate a novel cow-calf contact (CCC) system: smart-gates facilitate cow access to their calves in a designated CCC-area. In this system, separation entails that smart-gates will be closed parts of the day/night only to open at the same time every day. Cows and calves therefore experience that cow access into the CCC-area is restricted to pre-defined, gradually reducing daily periods. The time cows and calves spend close to the separation barrier (hereafter time spent close) may indicate both anticipation and, once no access is allowed, separation stress. Our aims were 1) describe how the time spent close varies in throughout separation. 2) investigate if individuals, within a 2 hr observation period, spend more time close as gate-opening is imminent. Direct observations (2dx2h) were performed before separation (baseline (BL) 24 h/d access), once cow access was reduced (separation (SEP) 12h), once pairs were accustomed (BL12h), after cow access was further decreased (SEP6h), once pairs were accustomed (BL6h), and when separation was full-ended (SEP0h). Using 1-min-scan sampling we registered whether cows/calves were positioned <1 m from the separation barrier. Across two batches of each 8 cow-calf pairs, 2.3 ± 5.00% of the cows and 7.4 ± 13.62% of the calves were observed close (n=480 observations) during BL24h. These proportions increased to 10.7 ±10.94% and 14.0 ±15.47% respectively at SEP6h. No increase was observed when access was further reduced to SEP6h (6.7 ±9.47% and 20.8 ±21.42% for cows and calves, respectively), however BL6h showed an increase in calves (30.4±20.87%). Preliminary results indicate a positive association between time spent close, and the minutes 0-120 during observation: more time may be spent close with increasing time. Further, preliminary descriptions indicate that time spent close changes within and between observations.

Maternal motivation in dairy cows

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In conventional dairy production, cow and calf are separated shortly after calving. This is done, among other reasons, to ensure more saleable milk for the farmer and to avoid stress when cow and calf are separated after forming a strong bond. Recently, this practice has received increasing critique from consumers, and research has found that calves gain multiple benefits from prolonged cow contact. Similar benefits are, however, also obtained by using so-called nurse cows, who nurse one or more calves. Conversely, the possible benefits gained by the cow through prolonged calf contact have received little attention. We therefore aim to measure the maternal motivation in dairy cows, to assess the importance of two types of calf contact for their welfare. Using a novel maximum price paid (MMP) test, we will compare the strength of the maternal bond and the nursing motivation of cows in two management strategies for prolonged cow-calf contact and a control treatment. This novel test provides a 'low cost' alternative to the valued resource, thus reducing the risk of frustration at high costs. Contact cows are housed either full-time or part-time with their calves for 10 weeks, while the control animals are separated 48 h postpartum. This will be the first study, to our knowledge, that uses the novel MMP test, and that investigates cows' motivation to nurse their calves. In this presentation, we wish to describe the novel methods and to discuss their potential use in further research within the cow-calf-contact area; e.g. to assess the difference in bond strength between a cow and her biological calf versus a foster calf. In addition, we wish to discuss the use of other methods to investigate the contribution of calf contact to cow welfare, as well as the implications of cow-calf contact on general dairy cow management.

Time budget of dairy cows with access to their calves in an automatic milking system

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Increasing number of farmers are implementing varying management systems where dairy cows and calves are housed together. Information is therefore needed on the ways that these management choices affect the behaviour and welfare of the animals. Our aim was to compare time budgets of conventionally managed cows and cows with controlled access to their calves (CCC cows) in an automatic milking system (AMS). We use automatically collected data from roughage bins, the robotic milking system and leg-mounted activity tags to observe differences in activity, lying and eating behaviour as well as milking robot visits during the first seven weeks of lactation. Data is analysed using linear mixed-effects models. All cows (n=54) were housed in the same feed-first and milking-first AMS unit. CCC cows could enter a separate contact area through a selection gate to visit their calves. The contact area included cubicles and concentrate feeders, but the cows had to leave it to drink and feed on roughage. CCC cows had lower daily lying time compared with control cows, especially in the early weeks (95% Confidence intervals: 7.7-9.6 and 9.1-11.2 h, respectively, in week 1). Lying time increased in both groups during the lactation. The roughage eating time was also lower and the milking intervals longer in the CCC group in the first lactation weeks, but these differences were diminished in weeks 4-7. Feed intake was similar in both groups, which indicates that CCC cows compensated for lower eating time by increasing eating rate. Parity had a significant effect on lying behaviour and eating time but not on milking intervals. In conclusion, the possible welfare effects of reduced lying time in early lactation in dairy cows with calf-contact should be studied further. Future analyses of the dataset will focus on details such as bouts and timing of behaviour.

The impact of clamp castration on the behavior and body temperature of reindeer (*Rangifer tarandus tarandus*) – effects of local anesthesia and non-steroidal anti-inflammatory drug

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Yearly 2500-4000 reindeer bulls are castrated in Finland, mostly without pain alleviation. To our knowledge, there is no previous research about pain- related behaviours during castration in reindeer. Our aims were to investigate the effects of castration on reindeer behaviour and body temperature during the procedure, and how these are affected by handling, local lidocaine anesthetic (LA) and non-steroidal anti-inflammatory drug meloxicam (NSAID). We clamp castrated 45 1.5-year-old-reindeer with either (n=11 in each) no pain alleviation (TRAD), perioperative NSAID (NSAID), local anesthetic (LA) and with LA and NSAID (LA+NSAID), and used 10 non-castrated reindeer as controls (CONTROL). We report here results from behaviors scored from video recordings (head, neck and leg movements, nostril closure, defecation, abdominal muscle contraction), rectal temperature (BodyT), and the number of reindeer reaching at least 39.5 ºC (BodyT39.5). We analysed the differences between the treatments with Kruskal-Wallis and Mann-Whitney U-tests tests, between sampling intervals (before and during castration/LA application) with Wilcoxon signed rank tests and between treatments in No of BodyT39.5 with CHI2 – test. There were no differences in behaviours between treatments prior to castration nor during injecting LA. However, during castration, nostril closures and abdominal muscle contractions occurred more often and for longer duration in TRAD, NSAID, LA and LA+NSAID than CONTROL ($p<0.05$ for all). BodyT increased during the experiment for all treatments. Overall, 25 animals reached BodyT39.5, and treatments differed ($p<0.05$): higher No for LA+NSAID (11/11) than TRAD (2/10), NSAID (3/11), LA (4/11), or CONTROL (5/11). Reindeer appear to express pain during clamp castration by closing their nostrils and contracting their abdominal muscles. Local lidocaine anesthesia failed to significantly reduce the pain related behaviors, at least with the 5 minute effect time used in this study. Moreover, long handling time increased reindeer body temperature, especially if combined with other stressors such as injecting NSAID.

Sending sows to slaughter with ongoing milk production – knowledge from studies of the clinical condition of cull sows

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In pig production, sows can be slaughtered at all stages of reproduction, but post-weaning culling is common. At weaning, modern prolific sows produce a substantial amount of milk. European Regulation (EC-1/2005) states that 'lactating females of bovine, caprine and ovine species not accompanied by their offspring shall be milked at intervals of not more than 12 hours'. Accumulation of milk in the udder after dry-off, and potential negative consequences of this, in terms of animal welfare, have received considerable scientific attention in dairy cows. Contrarily, for sows, the dry-off process after weaning has received very little scientific attention, and lactating sows are not legally protected during transport. In a survey among livestock drivers transporting cull sows to slaughter in Denmark, Thodberg et al. (2020) reported concern over fitness for transport of sows with engorged udders. Two Danish studies found that 30-40% of cull sows showed signs of ongoing milk production on the day of transport to slaughter (Fogsgaard et al., 2018; Thodberg et al., in prep.). Whether these results are representative are not known, and there seemed to be large variation between farms in their culling decisions. One challenge to cull sow welfare during transport is heat stress. When lactating, metabolism is increased, and therefore also heat production, and especially in prolific females. In their study of transportation of sows up to 8h under Danish conditions, Thodberg et al. (2019) found that the clinical condition of cull sows deteriorated on the way to the slaughterhouse. Among the risk factors were journey duration, temperature in the truck - often in interaction - and duration of stationary periods. Whether sows transported to slaughter with ongoing milk production face extra hazards in terms of animal welfare is currently not known.

Factors affecting pig and pen cleanliness and ammonia concentration on Norwegian farms

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Pigs prefer a clean resting area and an area for eliminating (urination, defecate). Inappropriate eliminative behaviour causes fouling of resting area and this has a negative effect on the environment, the cleanliness of pigs and pens, and can impair farm productivity. There are several environmental/ambient factors that can affect pig eliminative behaviour and, thus, to systematically study these factors on farm is of great importance. The objective of this survey was to investigate the effects pen design (pen partition (open or solid), and space per pig (m^2)), type of rooting material, amount of litter in the resting area, and ambient temperature and air velocity (over resting area) on cleanliness of the pen and the pigs and ammonia concentration. Data was collected from 87 pig farms across Norway and analysed using generalised linear model in SAS. The cleanliness of the pigs was higher when pen partitions in the eliminative area were open (slatted) compared to solid ($P=0.007$). Pig cleanliness increased with increasing space per pig in the resting area ($P<0.001$), with decreasing temperature ($P<0.001$), and lowering of air velocity ($P=0.003$). Other factors that increased cleanliness was using straw as rooting material ($P=0.028$) and increasing amount of litter in the resting area ($P=0.002$). Pen (resting area) was cleaner when pen partitions were open compared to closed ($P=0.010$), and with increased space pr pig in the eliminative area ($P<0.027$), using straw ($P=0.002$) or silage ($P=0.003$) as rooting material, and with increasing amount of litter ($P=0.002$). Ammonia concentration was reduced with increasing space per pig of the eliminative area ($P<0.001$), decreased space per pig in resting area ($P<0.010$), and increasing amount of litter ($P=0.006$). Our results provide a large variety of environmental/ambient factors affecting pig and pen cleanliness and ammonia concentration, and these factors should be taken under consideration while designing future pig facilities.

Can enrichment buffer early stress in commercial laying hens?

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Laying hens start off their lives in large-scale commercial hatcheries where they are exposed to various stressful procedures during their first day of life. Previous research has shown that this hatching process affects chicks' behavior, cognitive judgement bias, and corticosterone levels. In the present study, the aim was to investigate if the provision of early environmental enrichment could buffer the initial commercial hatchery stress. We compared Lohman LSL chicks processed in a commercial hatchery (HC) with a group of control chicks (CC) that was hatched at Linköping University. Chicks were distributed into separate rearing pens; an enriched and non-enriched pen for each hatching treatment. We studied chicks' behavior during a novel arena and social isolation test, and recorded their weight on a weekly basis. Weight, social isolation, and novel arena locomotion data were analyzed using generalized linear models. A Kaplan-Meier survival analysis was used to analyze emergence latency in the novel arena. CC were heavier at hatch than HC ($\chi^2 = 13.734$, df = 1, $p < 0.000$). At 22 days hatchery enriched chicks (HC-E) weighed less than hatchery non-enriched chicks (HCNE) ($F_{3,199} = 3.25$, $p = 0.023$). At 29 and 36 days HC-E weighed less than HC-NE and control non-enriched chicks (CC-NE) ($F_{3,199} = 6.95$, $p < 0.000$ and $F_{3,198} = 5.58$, $p = 0.001$). In social isolation HC-E emitted more distress vocalizations compared to CC-NE and control enriched chicks (CC-E) ($F_{3,198} = 4.12$, $p = 0.007$). During the novel arena CC-E had shorter emergence latencies than HC-NE ($\chi^2 = 4.300$, $df = 1$, $p = 0.038$), however, there was no difference in the number of quadrant changes between treatment groups ($F_{3,72} = 0.40$, $p = 0.753$). In conclusion, provision of early enrichment does not seem to buffer stress induced by the commercial hatchery.

Effects of the early-life and adult environment on laying hens' spatial cognition

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Laying hens' rearing and laying environments often differ in their degree of complexity, which can affect individuals' characteristics and welfare. We investigated the effects of environmental complexity during rearing on spatial cognition, and how the provision of enrichment during adulthood can modulate them. The objective was to obtain a deeper understanding of the effects of environmental complexity at different life stages on cognition. We tested White Leghorn hens in a detour task. These hens were cage- or aviary-reared, and housed in standard or enriched furnished cages during laying (4 groups, n=16 per group). The degree of complexity of the adult environment was higher in enriched furnished cages than in standard furnished cages, with dustbathing platforms and curtains. Each hen was tested twice (62 & 64 weeks) and latencies to perform the detour were recorded (cutoff of 10 minutes). Results were analyzed using survival analyses, and pairwise comparisons were performed using log-rank test. Analysis showed a significant difference between hens reared in cages and housed in standard furnished cages and hens reared in aviaries and housed in enriched furnished cages at both ages (62w: p=0.028; 64w: p=0.032). For each rearing condition, hens housed in enriched cages during lay tended to perform better than those housed in standard cages. The hens were also faster to perform the detour during the second test (62w: mean=476s vs 64w: mean=397s), and more individuals accomplished the task before the cutoff (62w: n=26 vs 64w: n=32). Thus, the complexity of the rearing environment has long lasting effects on spatial cognition and the ability to solve a detour task. Rearing hens in cages leads to individuals with poorer spatial skills, probably due to the lack of complexity. However, the adult environment can partly compensate for this if it offers a higher degree of complexity than the rearing environment.

Filming pigs during transport in commercial lorries - examples from cull sows sent for slaughter and weaners sent for further production

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Transportation of live animals, especially on longer journeys, lack evidence-based knowledge. Almost all livestock are transported at least once in their life whether for further production, breeding or slaughter. The number of pigs transported between EU member states has been relatively constant, around 33 million animals per year, with a recent increase in transport for further production. Denmark exports around 15 million weaners per year for further production and up to 50% of sows are sent to slaughter each year. Yet, these groups have received little scientific attention during transport. One reason for this may be the challenge of making behavioural observations in a moving vehicle and with a limited deck height. Our recent study on cull sows illustrates the difficulty as our success rate with video recordings were only about 50%. Yet, our observations contradict the common expectation that the sows lie down during transport, potentially leading to fatigue with increasing journey duration. In our ongoing study on long journeys involving weaners, we so far have a 95% success rate with a specially adapted camera system that can film pigs in an area of 5-6 m^2 with 60 cm deck height. Deck height during transport according to EU Regulation 1/2005 must ensure 'adequate ventilation above the animals when they are in a naturally standing position, without on any account hindering their natural movement'. Based on our new video recordings during the journeys as well as in the hours after unloading, our ongoing research project aims to establish new knowledge about pig behaviour, thereby allowing informed choices of recommendations on deck height for transport of weaners. During the presentation, examples of video recordings and possibilities for behavioural analyses of these in terms of the interpretation of 'hindering natural movements' will be discussed.

A new quantitative method for the assessment of piglets´ resistance movements during castration

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Piglets´ castration is a routine practice reported to be painful. In an effort to alleviate pigs´ response to the procedure, pain-mitigating measures such as administration of local anesthetics are mandatory in some countries, including Denmark. The efficacy of such measures is often partly evaluated using quantification of movements by piglet´s front legs, so-called resistance movements. In the absence of a standardized recording method, most studies have used a visual grading scale to judge the general level of front leg movements in response to the procedure. Yet, this semi-quantitative method is likely limited in terms of sensitivity, and thus may not allow proper interpretation of leg movements in terms of stress and/or pain. A quantitative recording of pigs´ resistance movements was therefore developed in this study. As part of a larger project, 318 piglets aged 3 to 4 days were placed in a commercially available castration bench adjusted for body size and submitted to one of three procedures: castration after intra-testicular injection of local anesthetic (Procamidor® Vet, 2x0.5 mL) (n=104), castration without anesthesia (n=107), or a stay in the bench with no tissue damage inflicted (n=107). Piglets' leg responses were recorded using a camera, and footage were analyzed at five frames per second (FPS). Initially, randomly chosen video clips were observed to detect recurrent, identifiable movements. Four types of movements were selected and described: flexion, extension, kick, and blow. Each video sequence was then analyzed, and the occurrence of each type of behavior was recorded and analyzed in a statistical model correcting for the duration of observation. Castration under local anesthesia led to significantly less resistance than castration without pain mitigation ($p=0.010$, 25.2 ± 18.2 vs. 40.3 ± 19.1 movements), but resulted in twice as much resistance as the simple stay in the bench ($p=0.001$, 12.4 ± 11.4 movements).

Behaviour in dairy calves with and without their dams on pasture

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Common practice in dairy farming has been to separate cow and calf within short time after birth. There is increasing debate and attention around the ethical aspects with a farming system with early separation, and there is a need for more knowledge on cow-calf contact in dairy farming. The aim of this study was to examine behaviour of dairy calves with and without their dams on pasture. A total of 20 cow-calf pairs were divided into two treatments, and two groups per treatment. Ten pairs were early separated (ES) where cows and calves were let out on separate pastures, and ten pairs had cow-calf contact (CC) fulltime on pastures until week 6 after birth with gradual separation and weaning in week 7-8. Individual direct behaviour observations of calves on pasture were carried out in week 3, 6 and 9 for each group, one day per week and 8 hours per day. This was done with instantaneous sampling including use of calf hutch, grazing, lying and standing/moving, and one-zero sampling including allogrooming and play. Statistics were done on Minitab with ANOVA-Mixed effects model where the model used for each behaviour was: y = intercept + treatment + Group(treatment) + Calf(treatment; group) + week + treatment*week + error. The results showed that ES-calves used the calf hutch significantly more than CC-calves, but CC-calves used it more with age. There were no significant differences in the other behaviours between the treatments, but several differences with age, where e.g. calves in both treatments grazed the most and were lying the least in week 9 after weaning.

Lying behaviour of lactating dairy cows in a cow-calf contact system

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Cow-calf contact (CCC) systems are dairy rearing systems that provide an alternative to conventional systems, which often involve the separation of cow and calf at an early age. Existing research on CCC systems has focussed largely on calf production and welfare measures, while important cow measures – including daily lying time – are lacking in literature. Therefore, the aim of this study was to describe the lying behaviour of dams housed in a CCC system in terms of daily lying duration as well as lying location for dams with access to their calves. Upon calving, cow-calf pairs (Swedish Holstein, n = 15; Swedish Red, n = 25) were assigned to one of two treatments: separation shortly following parturition (CTRL) or dam-rearing (TRT), where calves would be raised in a CCC area located within the freestall housing facility. The CCC area contained stalls and was accessible to both calves and TRT cows. Calves also had access to a separate calf creep, which provided a deep-bedded lying space, as well as access to roughage and concentrate. Lying time was automatically recorded for all cows using leg-mounted tri-axial accelerometers (IceQube, IceRobotics). Lying location of TRT cows (CCC area vs rest of pen) was collected for a 24-h period weekly via scan sampling of video recordings at 10-minute intervals. Both measures were collected during a 14-week period, starting from when the last cow-calf pair entered the experimental pen and ending when the first calves were separated. Across all weeks, TRT cows spent over 75% of their daily lying time within the CCC area. Daily lying time did not differ between CTRL and TRT cows, indicating that access to the calf does not interfere with general lying time of the dam in a CCC system.

Gradual weaning of 3-month-old calves from foster cows

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When calves are reared by cows, separation can be stressful. It is often advised to do the weaning and separation in two steps. In foster cow systems another gradual weaning method is to remove the foster cows, one by one, from the cow-calf group. The aim of this study was to observe the behavioural response of calves to gradual weaning from foster cows. On a commercial farm, calves were fostered to a designated foster cow in pairs and then housed in groups of 4-7 foster cows and their 8-14 calves until gradual weaning at 3 months. The behavior of the gradual weaning process of 30 calves belonging to five groups was observed. Behavioral recordings were analyzed 18 h before any foster had been removed, as well as 18 h before and after the designated foster was removed from the group. Prior to the removal of any foster cows, calves spent on average 44 (±5) min/18 h sucking of which 56% was from the designated foster cow. The total duration of sucking was similar the day before and after the designated foster was removed (42 (±4) vs. 38 (± 4) min/18h; $F_{1,28}$=0.75; P=0.40), because the duration of sucking another cow than the foster increased from 18 (±4) to 38 (± 4) min/18h; $F_{1,28}$=23.6; P<0.001). The number of aggressive events calves received from other cows increased from 1.5 (CL 0.8-2.6) to 2.2 (CL 1.3-3.8) per 18 h; $F_{1,29}$=5.77; P=0.023). Thus, when the designated foster was removed, calves sucked other cows more, but the calves also received more rejections and although sucking time was unchanged, they may have had to put more effort to maintain an unchanged milk intake. This gradual weaning method may compromise the welfare of the foster cows left to wean off an increasing number of calves in the group. This warrants further research.

PLENARY: The human-animal relationship and its role for farm animal welfare

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The human is an important part of the animal's environment. Humans affect animal welfare by their decisions on housing and management, their skills in implementing the decisions and providing daily care as well as by interacting with the animals when working with them or in their environment. Interactions with humans inevitably occur throughout farm animals' life. The frequency, type and quality of interactions vary widely between but also within production and husbandry system. From the animals' perspective, such interactions can be perceived on a continuum from negative (involving unpleasant emotions such as fear) over neutral to positive (involving pleasant emotions). The absolute and relative number of such interactions in the past affects the animals' actual perception of humans, i.e. their relationship towards humans, which in turn affects the nature and perception of future human-animal interactions (HAI). If the relationship is poor, interactions with humans will often be a source of fear, while a good relationship not only provides frequent possibilities for pleasant emotions during positive interactions but might even reduce the perceived aversiveness of events like restraint or veterinary procedures. Therefore, HAI and the human-animal relationship (HAR) impact strongly on animal welfare. Research in different farm animal species confirmed effects on behavioural and physiological stress and anti-stress reactions, subsequent effects on productivity, ease of handling, risk of accidents and animal health. Besides this direct effects of HAI and HAR, the HAR exerts effects on animal welfare also indirectly via associations with farmers' decision making and problem solving abilities. A better relationship of farmers to their animals is associated with more welfare-friendly husbandry conditions and lower levels of social stress. In conclusion it is important to consider the HAR on a given farm in quality assurance schemes, health and welfare plans and improvement strategies. Training for best practice handling could not only improve animal welfare but as well human welfare by increasing human safety and job satisfaction.

Investigating the reliability of a separation- and reunion test performed on pet dogs (*Canis familiaris*) and their owners

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Today, many humans refer to dogs as family members and research has shown that a dog and its owner show similar attachment behaviour towards each other, as would a child and its parent. The urge to express attachment behaviour is activated by stress, e.g. separation from each other. Therefore, separation- and reunion behaviour are commonly used when evaluating the relationship quality. However, this method has not been evaluated for its reliability, which was the main aim of this study. Fifteen dogs and owners participated in a separation- and reunion test at two occasions each, in order to investigate if the behaviour of dog or owner differed between occasions due to uncontrollable factors such as daily conditions or mood. In addition, owners answered two questionnaires regarding their adult attachment style. To study potential links between the behaviour of dog and owner during the test and the adult attachment style of the owner, Spearman rank correlation tests were performed. Results showed no differences in the behaviour of the dog (nor owner) between the two tests, indicating that daily conditions or mood did not affect the behaviour during the test scenarios. More anxious owners had dogs who paid more attention to ($r=0.426$; $p=0.019$) and stayed closer to them ($r=0.434$; $p=0.017$) upon departure from the room. Also, these dogs explored less ($r=-0.446$; $p=0.013$). During separation, dogs of more anxious owners vocalised more ($r=0.459$; $p=0.011$). More avoidant owners talked less to their dogs ($r=-0.390$; $p=0.033$) at reunion, and their dogs paid less attention to them ($r=-0.474$; $p=0.008$) and initiated less physical contact ($r=-0.497$; $p=0.005$). Instead, these dogs explored the room more ($r=0.520$; $p=0.003$). In conclusion, the separation- and reunion test is considered as reliable for its use in the study of dog-owner interactions and serves a potential tool when evaluating relationship quality.

Handling and stunning of pigs and cattle at slaughter: development and implementation of animal welfare protocols

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The welfare of food-producing animals in the meat industry, especially at the time of slaughter, has become an area of increasing public interest. In order to ensure an acceptable level of animal welfare at slaughter, there is a need of science-based methods to assess how animals experience their situation. The aim of this study was to develop and evaluate the applicability of animal welfare protocols based on animal welfare indicators for pigs and cattle at slaughter. The protocols, based on Welfare Quality ®, covered driving of animals (D), behaviour in the stun box (S, cattle only) and stunning quality (SQ). The protocols were tested on 191 pigs and 69 cattle at a Swedish slaughterhouse. The pigs were driven and stunned in groups of 2-3. The cattle was driven in groups of 2-3 and stunned individually. For pigs, D included e.g. use of driving tools and high pitched vocalisation. SQ included e.g. corneal reflex and gasping. Both protocols were considered applicable to use in the present form. For cattle, D included e.g. use of driving tools and voice commands. D was considered applicable although slaughterhouse interiors sometimes challenged behavioural observations and not differentiating between different types of voice commands which could be refined in the future. S included e.g. escape attempts and struggling and was considered applicable in the present form. SQ included e.g. corneal reflex and rhythmic breathing. The stun quality assessment from SQ did not co-align with the assessment of the slaughterhouse nor the competent authority and was not considered suitable to use in the present form. Future research should focus on understanding the discrepancies between these assessments. Apart from SQ in cattle, which needs to be refined, the protocols were consider applicable to use in the slaughterhouses continuous work to improve and ensure animal welfare at slaughter.

Farmer´s attitudes towards dairy cow cleanliness: a qualitative study

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The negative consequences of having dirty dairy cattle are well known, as it will affect the animal welfare as well as the efficiency and economy of dairy production. But despite this, the occurrence of dirty cattle is increasing in Sweden. A recent Swedish study revealed that 49% of cattle farms had insufficiently clean animals. The study result revealed that farmers have a wide understanding of how cleanliness in dairy cattle can affect the dairy production productivity, but also a lack of knowledge about the occurrence of dirtiness of dairy cattle in Sweden. It also revealed how communication between authorities and farmers need to be improved and how farmers mental health, economy, general attitude towards dairy cattle and relationship with them, as well as farmers education in animal welfare, may influence the occurrence of cattle dirtiness on Swedish farms. Preventive measures in order to reduce the occurrence of dairy cattle dirtiness may include information and education on the occurrence of this problem, how to prevent it and what consequences dirtiness of dairy cattle can have. The relationship and communication between authorities and farmers also needs to be improved. Farmers mental and physical health need to be prioritized, as the study result revealed that farmers health also may influence cattle dirtiness. Hence, finding ways to improve farmers' health and creating a supporting system for farmers in need of extra help, mentally as well as physically, may be important in order to increase cleanliness of dairy cattle.

Cat-Human Interactions in a cat café: implications for health and welfare

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Sweden's first cat café opened in 2019 and operates both as a café and as a rehoming facility, where all resident cats are available for adoption. Still, this setting involves several known stressors for cats. The overall objective of this study was to investigate human-cat interactions in a cat café, focusing on health and welfare. The aims were to (1) define cat space use and cat-cat interactions (2) explore human-cat interactions considering human age and gender, and (3) identify any positive effects on the customers. We performed direct behavioral observations on 27 neutered/spayed cats with a median age of four years and varying backgrounds between October 2020 and April 2021. To assess the potential positive effects of the cat café, customers could respond to a voluntary, anonymous questionnaire. The cat café received a median of 59 customers per day, and high occupancy (> 29 customers/session) was associated with a preference for elevated areas and display of alert/fear behaviors. The rate of cat-cat interactions was low (0.58 interactions/cat/h) and did not depend on the sex of the cats. Human-cat interactions differed depending on the age and gender of the human partner (i.e. boys, girls, men, and women). Due to possible bias and low participation rate (< 0.68 % of customers) no statistical analyses were performed on the questionnaire. We suggest several recommendations to promote cat welfare in cat cafés, such as providing hiding spots, complex vertical space, and a cat private area. Yet, further research is needed to understand the human-cat interaction in cat cafés, the long-term effects of high customer occupancy on cat behavior and welfare, and the potential benefits for the visitors.

Animal Assisted Intervention with cats in Swedish retirement homes – impact and welfare of the cat

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Elderly people in Sweden who live in retirement homes have been reported to experience loneliness, anxiety and depression to a greater degree than those who live at home. The pandemic has affected Swedish nursing homes greatly, and visits to elderly people living in retirement homes was prohibited in March 2020. Animals and Animal Assisted Intervention (AAI) have been shown to have a great impact on people, and elderly have been reported to feel less anger, anxiety, loneliness and depressed after AAI. This study aimed to examine whether Swedish retirement homes in Uppsala and Stockholm's county use animals in their daily activities, and whether the pandemic have had an impact or not. The study was mainly focused on cats and their impact on elderly people living in retirement homes. An online survey was sent to 315 retirement homes, and was completed by 109 (35%) of the homes. Results show that almost 80% of the retirement homes have or have had some kind of animal activity. Cats are the most common animal living in these homes, and dogs are the most common visiting animal. Other animals such as hens, horses, aquarium fish and farm animals were also reported. During the pandemic visits have been cancelled, and it has been harder to arrange visits with care animals, such as therapy dogs or horses. The retirement homes that have a cat living with them have seen a great impact of the cat on the elderly, and no allergy or injuries have been reported in the elderly due to the cat. Four homes saw an increased risk with spreading of Covid-19 due to the cat. Cats seems to have an important role to elderly people. They have a great positive effect, which might have been important during the lockdown when elderly may have felt even more isolated, lonely and depressed than before. The risk of cats spreading Covid-19 is low, according to existing studies, and cats do not seem to have an important role in the Covid-19 epidemiology. They do not seem to be affected by the virus, even though they can be infected and replicate the virus, and their health or welfare are not affected by Covid-19. In conclusion cats in retirement homes are an important asset, and can improve quality of life in elderly living in retirement homes. The welfare of the cats must however be considered, but as long as the cats' gets the health and social care they require their welfare do not seem to be affected negatively.


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