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Behavior in a case of feline acquired blindness

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Abstract

The article deals with behavior changes that can be observed in early acquired blindness from the point of a case study. It uses available scientific data to explain the development of certain modalities in a visually deprived stray cat situated in a home environment. Review of scientific literature offers intriguing explanation to observed adaptive reactions.

Keywords: Blindness, behavior, feline, adaptive reactions, foster care

1. Introduction

Blindness seems a debilitating condition in humans as well as animals. However, it may be well compensated due to the adaptive abilities of the nervous system.

If you think of famous musicians you may come to the names of Andrea Bocelli, Stevie Wonder, Ray Charles and the common thing about them is their blindness. The loss of vision may not correlated to musical talent but nevertheless science has proved the fact of increased auditory ability in disturbed visual pathways ^[1]. Early-blind subjects display higher auditory spatial orientation than sighted ones ^[2]. According to Kolarik *et al.* cross-modal calibration of audition by vision depends on the severity of visual loss; for example, greater visual impairment is associated with more accurate room size estimates ^[3].

What do we know about cats?

Cats may be born blind, for example due to the rare condition anophthalmia, or acquire blindness as a result of infectious, metabolic or intracranial causes⁴⁻⁵. One common condition found in young cats, especially in stray ones, is feline herpes virus 1 (FHV-1), that can lead to viral conjunctivitis and herpetic keratitis ^[5-6], sometimes ending with severe panophthalmitis (*ophthalmia neonatorum*) ^[6]. Feline calicivirus (FCV) can also result in less severe disease with conjunctivitis, mucoid discharge and sometimes chemosis ^[6, 8]. The most important causative agent of bacterial conjunctivitis is *Chlamydia felis* ^[8, 5]. Behavioural changes are expected with bilateral blindness ^[4]. These can be a part of the clinical signs in the case of systemic illness, but often reveal the ability of the brain to compensate. Blindness does not necessarily affect the quality of life, there are few overt impairments in natural behavior⁹ and cats are usually able to comfortably adapt to the environment ^[10-11]. There are several studies dedicated to the mechanisms of neural change due to vision loss that will be discussed in this paper.

2. Case presentation

The patient in this case study is a male stray cat around one and a half month old. It was found wandering and disoriented on the street and brought to a foster home. After routine medical procedures and testing it was prescribed a long term local and systemic antibiotic therapy. The cat was left to be socialized and prepared for adoption. Observation was carried out from distance as well as in contact with the animal. Behavior manifestations were recorded during a period of one month. It was assumed that the cause for blindness was acquired and due to bilateral chronic ophthalmic condition, most possible FHV-1 and/or FCV complicated with severe bacterial infection.

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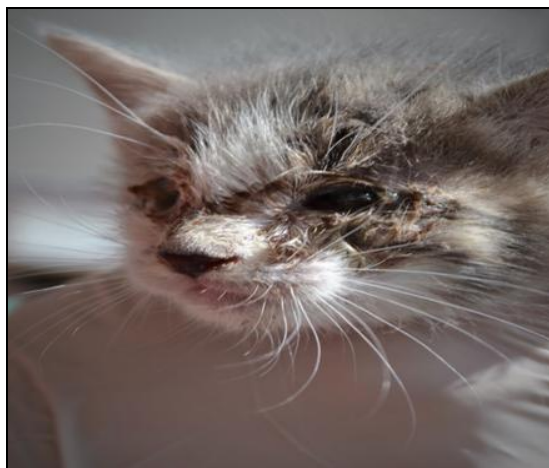


Fig 1 and 2: A male kitten with severe panophthalmitis and loss of both eye balls possibly due to mixed viral and bacterial infection

The cat was diagnosed with panophthalmitis and had already lost both eyes when found. Signs of rhinitis were mild. It was treated with antibiotics for 14 days to combat the purulent discharges from ocular cavities and was planned for enucleation.

During the first days in the foster home the animal remained disoriented, was constantly vocalizing and moving around, often bumping at objects. However, by the end of the first week it became more calm and comfortable with its surroundings. It allowed contact with humans (kids also) and other animals from the household (a 5 year old spayed female cat and a 14 year old spayed female dog).

It was observed that the loud vocalization remained constant during the whole period but it was no more related to stress. The cat was vigorously moving the head around with ears and moustache straight in an attempt to better localize the sound source and perhaps attain clearer sensory signals from the environment. Slowly the animal became able to follow people by the sound of their steps going in between the legs and changing direction when the walking also changed. It was even able to coordinate the speed of footsteps and go at the same pace. It soon learned to recognize the sound of the door open or close and tried to run out of the room it was kept in. It began playing with the tail of the dog and found its way to a hanging kitchen towel. Of course it was very fast spotting the place of its meal cup by the sound of canned food being opened. A negative behavior that was connected with feeding included running to the cup, snatching the food with jaws and paws, eating fast, growling, not letting other animals and even humans close during this time. Otherwise it was friendly and

not showing any other signs of aggression. Hygiene habits developed normally and the cat was able to use the litter from the very first week.

3. Discussion

All these observations show that the cat with early onset blindness from this case was able to map its environment with other sensory input other than the sight. It can be suspected that the loud vocalization that remained constant is not only a way to signal its presence to others. It may be an attempt to find objects through possible echolocation. An experiment carried out by Veraart *et al.* showed that early visually deprived cats were able to use an ultrasonic echolocation prosthesis to evaluate depth and avoid obstacles [12]. Several cases of echolocation were described in humans¹ and it can be expected in cats as their hearing range includes ultrasound [13, 14].

Bilaterally blind cats showed rapid learning capacity of auditory tasks with stronger targeting reflexes evoked by the cues [15]. They show improved abilities of auditory localization and at least equal tactile behavior compared to normal controls [9].

Pathways involved in neuronal plasticity were also studied. In bilaterally blind cats the anterior ectosylvian visual area is completely taken over by auditory and somatosensory inputs [9]. Neurons from the caudal part of the anterior ectosylvian (AE) cortex, that obtain purely visual responses in normal cats, begin to react vigorously to auditory and, to some extent, somatosensory stimuli in visually deprived cats [16]. Visual deprivation from birth is found to induce intermodal changes that enhance the response specificity of neurons in the auditory cortex [17]. Furthermore, facial vibrissae become hypertrophied with a corresponding expansion of their central representation in the somatosensory cortex [9].

The Anterior Ectosylvian Sulcus occurs at the junction of the feline temporal and parietal lobes. It includes the Fourth Somatosensory representation (SIV), the auditory Field of the Anterior Ectosylvian Sulcus (FAES) and the anterior ectosylvian visual area (AEV) [18]. "The AEV receives considerable ipsilateral projections (~35%) from non-visual cortical areas as well as from the multisensory thalamic nuclei. Of those non-visual afferents to AEV, neighboring AESc regions of SIV and FAES contribute 13.1% and 3.7%, respectively" [19].

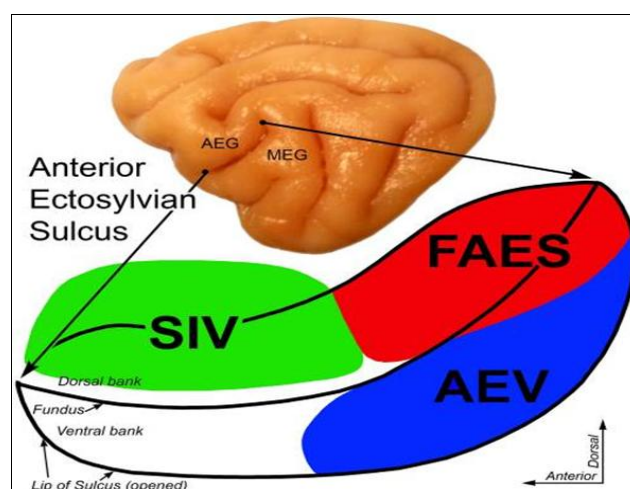


Fig 3: Lateral view of the cat cerebral hemisphere with representation of the Anterior Ectosylvian Sulcus (AES) that includes the fourth somatosensory representation (SIV), the auditory field of the anterior ectosylvian sulcus (FAES) and the anterior ectosylvian visual area (AEV) From: Meredith *et al.* 2018) [19]

Intermodal compensatory plasticity in the cerebral cortex of young animals allows for increases in the amount of auditory cortical representation, possibly by an expansion of nonvisual areas into previously visual territory ^[16]. The occipital cortex acquire the capacity to participate in enhanced somatosensory or auditory processing ^[20]. This can be explained by a reorganization of sensory representations under the guidance of sensorimotor feedback ^[9] and adaptive sensorimotor transformation ^[21].

No information was found in scientific literature correlating aggression to blindness in the cat. However, growling and keeping the bowl can be explained by common food aggression and stress in a multi-animal household. On the other hand, it may be a way of signaling to an invisible object, as no direct injurious behavior was observed.

4. Instead of conclusions: Taking care of the blind cat

The young cat from this study was completely able to take care of itself and orient in the environment. However, it took some time to adapt and this happened again when it was transferred to another foster home. A blind pet needs some time to get acquainted to its surroundings, it often feels disturbed with new objects and living beings and may be reluctant to move from the save territory, though many learn to climb and even jump. It is not recommended to let such animals to roam outside the house or have access to windows and balconies. They need increased attention from owners especially in situations that may pose danger. The food bowl, the litter tray and furniture should be kept in the same place. One may find that their whiskers seem crushed because they are used for sensory orientation. Blind animals benefit from loud, clear talking; they may enjoy squeaking and catnip toys they can smell. And last but not least, they make wonderful pets that are worth adopting.

5. Conclusion

This case study demonstrates that early-onset blindness in cats triggers significant behavioral and neurophysiological adaptations. The visually deprived cat rapidly developed enhanced auditory and tactile abilities, used echolocation-like strategies, and effectively navigated its environment, highlighting the brain's compensatory plasticity. Observed behaviors, including vocalization, orientation to sounds, and careful interaction with other animals, underscore the practical relevance of multisensory enrichment and structured environments for blind pets. For caregivers, maintaining consistent spatial arrangements, providing auditory cues, and ensuring safety are essential. Future research could explore the neural mechanisms of cross-modal compensation in felines and evaluate interventions that enhance adaptive behaviors, offering insights applicable to both veterinary care and comparative neuroscience.

Conflict of Interest

Not available

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Not available

Reference

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