Abstract

Captive environments can provide a variety of sources of stress for animals with space limitation being one of the primary contributors. Spatial restrictions may result in psychological stress by which the memory and learning of animals can become impaired. One solution to spatial stress has been to increase the size of the enclosure for captive animals. In my dissertation, I questioned the rationale of providing increased space by investigating whether more space leads to greater use of space.

My study had 2 aims. Firstly, I tested whether the previous experience of an individual, or of a group of individuals in a small area, would influence the subsequent use of space when they were introduced into larger enclosures. I used 4 different species (chimpanzees, striped mice, woodlice and cockroaches). Secondly, I tested whether the spatial perceptions were dependent on neuronal complexity in terms of cognitive ability, i.e. is space use of a species related to neuronal complexity. Chimpanzees and striped mice were considered to have greater neuronal complexity than woodlice and cockroaches since mammals display more complex cognition compared to arthropods. The chimpanzees comprised of 8 individuals at the Johannesburg Zoo, 7 of which were transferred from a 10 m x 10 m enclosure, in which they were housed for 2 (second youngest individual) to 25 years (oldest chimpanzee), to a 2500 m^2 enclosure (in which the youngest chimpanzee was born), and their space use was evaluated in terms of subgroup space use in the enlarged enclosure. Chimpanzees are naturally social and thus I examined group instead of individual spacing. Chimpanzee subgroups, which comprised 2 or more chimpanzees, consistently restricted their space use in the enlarged enclosure to the size of their old enclosure, choosing their positions within the enclosure based on the presence of shade availability. Striped mouse space use was evaluated in terms of individual space use because striped mice from the mesic grasslands of South Africa are solitary living. Individual striped mice were placed into an enlarged arena (200 cm x 15 cm x 100 cm; L x H x B) after being restricted in a smaller cage (36.5 cm x 20.5 cm x 15 cm) for 60 days and their space use and distance travelled were measured against the area of their old housing. The space use of restricted striped mice was evaluated against a control group. The striped mice from the restricted group restricted their space use to the size of their original housing, with those having a shy personality showing more restricted space use than bold individuals. Woodlouse and cockroach space use was evaluated in same sex pairs, as woodlice and cockroaches tend to form aggregations naturally. Both species were originally housed in an 8 cm^2 area for 14 days and their space use in an enlarged

arena of 154 cm^2 was evaluated and compared against control groups of both species. Woodlice restricted their movements within the size of their original housing, with previously restricted males restricting the area used and previously restricted females restricting the distances travelled. While male cockroaches travelled shorter distances than females, the cockroaches did not spatially restrict their movements in the enlarged arena, indicating that they may be displaying a rebound effect.

My study demonstrated that previous experience in restricted housing does have an effect on subsequent space use in an enlarged area. This notion of previous experiences influencing later experiences is the foundation of learned helplessness. Learned helplessness is the passive response to mostly aversive stimuli in which an organism has no control over the outcome of the situation and thus gives up after repeated failure. Learned helplessness appears to be a plausible explanation for the space restriction in chimpanzees, striped mice and woodlice, as these three species restricted their space use based on the previous experience of less available space. Chimpanzees and striped mice had higher occurrences of restricted movements compared to woodlice, indicating that learned helplessness with respect of space use maybe graded according to neuronal complexity. I conclude that providing additional space may not address the welfare concerns of captive animals, because more space did not disrupt earlier spatial restriction. However, the implications of exposure to restricted space needs to be considered for all species in captive environments, especially animals in release programs, as exposure to restricted space may contribute to the expression of learned helplessness, with space use in an enlarged area being influenced by previous restrictions.