Is light a sufficient reinforcer for the evaluation of cage enrichment items for mice by Consumer Demand Theory?

A. Schraepler, H. D. Stelzer, H. Hackbarth

Institute for Animal Welfare and Behavior, School of Veterinary Medicine Hannover, Germany

INTRODUCTION:

The results of choice tests made clear that animals ‘like’ enrichment items and also show a wider range of behavioral pattern when kept in enriched cages. It is suggested that enrichment items have a positive effect on the development and the physical and psychical well-being (VAN DE WEERD 1998). By establishing enrichment items and consequently changing a certain standard of housing conditions (GÄRTNER 1991) the results of animal experiments can be influenced. Our research is based on the ‘Consumer Demand Theory’ deriving from economics. In this theory the amount of goods sold to costumers is measured after increasing the price. Goods necessary for life do not experience any decrease by increased prices whereas other goods are bought less depending on personal needs. Ethologists use this concept to determine the necessity of different enrichment items. In order to get access to a certain resource the animals have to “pay” by increased muscle work or by having to accept a negative stimulus.

MATERIAL & METHOD:

In this study 6 groups (=cage) of male Balb/c mice (n=6) obtained from Charles River were used. Each cage contained 3 to 4 mice. At the age of 3 weeks the animals were marked and randomly allotted to type III Makrolon cages. After two weeks the animals were transferred into the experimental setup, the double cage = DC (Figure 1). It consisted of two Makrolon III cages connected by a perspex tube. The animals had the possibility to adapt to the new environment for another two weeks. At this time both Makrolon cages contained food, water and sawdust. Hereafter one of the cages (enriched cage = EC) contained a water bottle whereas the other cage, the standard cage (SC), contained food and sawdust. In addition to that there is a difference concerning the light regime. The SC was exposed to a 100 lux 12:12 light/dark cycle while the light intensity of the EC was increased logarithmically from 100 to 3200 lux and the illumination was permanent. Each light intensity lasted for three days. Afterwards the next light intensity was selected. The two cages were divided by a photoelectric wall.

Behavioral pattern were observed.

D = drinking
E = exploration; every movement, sniffing, rearing and jumping
G = grooming; every interaction with a cage mate
C = climbing

AIM:

As in groups of mice often one animal did the work whereas the another consumed, so far research had to be carried out with single housed animals. Sources of irritation due to the animals isolation were accepted.

In this study the sources of irritation were avoided. Light was used as a negative reinforcer because all mice of one group had to accept it if they want to consume the enriching object.

We wanted to find out if increased light intensities change cage entries, drinking behavior and other behavioral patterns.

RESULTS:

There was a significant effect of high light intensities on the number of cage entries (Fig. 2). There were less cage entries whereas the amount of the water taken in by the mice stayed the same.

The overall time spend in the EC decreases (Fig. 3) at 3200 lux and so did the behavioral pattern D (Fig. 4), E (Fig. 5) and C (Fig. 6).

The grooming behavior G was not influenced by increased light intensities (Fig. 7).

All data shown as means +/- S.E.M, n=6 in all graphs

CONCLUSION:

Light is a possible negative reinforcer to evaluate enrichment items for mice. In accordance with other studies the mice accepted the negative reinforcer to get access to the water. Further studies with enrichment objects have to be carried out.