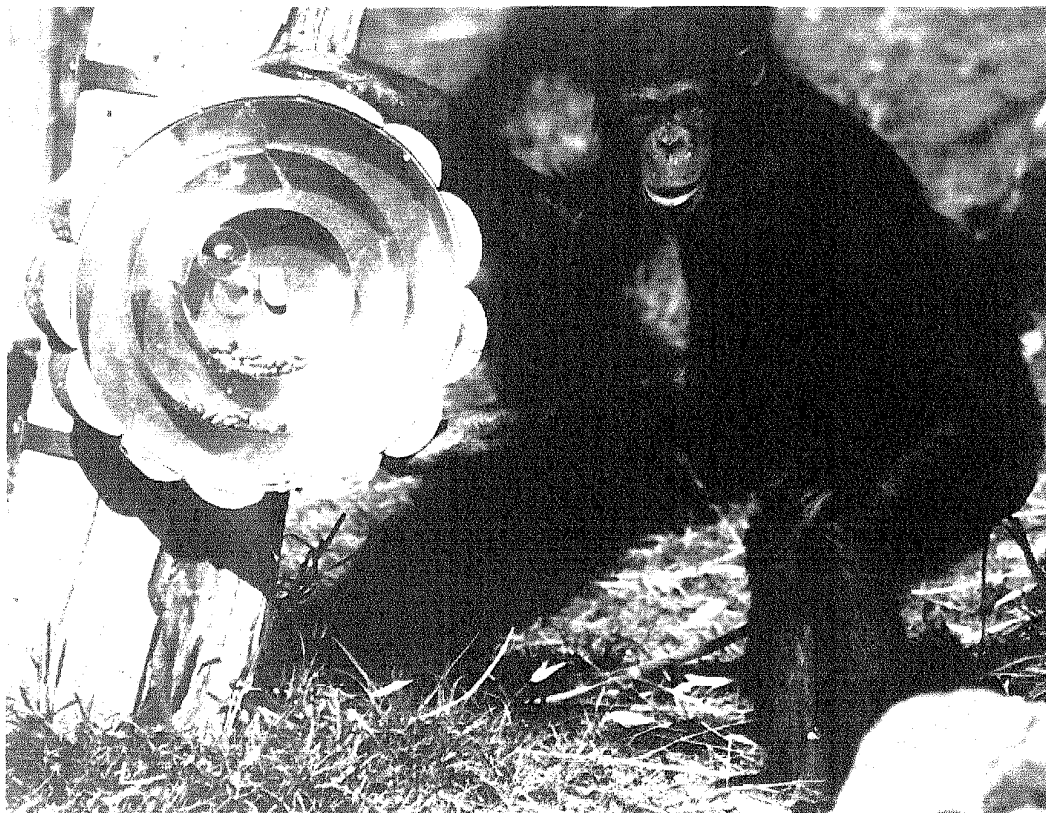


THE FACILITATION OF EXPLORATORY BEHAVIOUR AND OTHER
BEHAVIOURAL CHANGES
BY THE PRESENTATION OF NOVEL OBJECTS TO
RATS (*Rattus norvegicus*), CHIMPANZEES (*Pan troglodytes*) AND
CARACALS (*Felis caracal*)



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SUMMARY

Studies of exploratory behaviour within psychology have been conducted for over a century, and typically take place within the laboratory with rats. Arguably, researchers have failed to choose stimulus configurations that are relevant to conditions likely to be encountered in natural environments. Yet, exploratory behaviour is vital to the survival of wild rodents, felids and primates. Wild rats are subject to predation, which can be avoided if they are familiar with their environment, and familiarity with the home range is maintained through regular patrolling. Wild felids also patrol and monitor their home ranges, and exploratory behaviour forms a part of successful hunting strategies. The many field studies of chimpanzees provide a rich source of material on exploratory behaviour: patrolling, object play, object manipulation and tool-use. However, evidence for reactions to novel objects is usually anecdotal in nature, and this is indeed the case for most species.

Since the 1980s, schedules of reinforcement have largely become tools used to investigate other phenomena. For example, researchers have used them to model general foraging strategies, but have not always manipulated the key variables in an ecologically relevant way. Researchers have also developed more naturalistic open-field style Skinner boxes, which allow more extensive investigations of behaviours (other than the operant response) that occur during schedules of reinforcement. Rats will engage in exploratory behaviour during schedules of intermittent food-reinforcement, if the opportunity is available. Certain schedules coupled with the appropriate environmental conditions increase the probability of adjunctive behaviours occurring. Importantly, the gap between psychological and ecological research is rapidly diminishing.

Exploratory behaviour and other non-instrumental responses have been found to occur in rats run in an open-field style Skinner box during *fixed-ratio* (FR30), *continuous reinforcement* (CRF) and *extinction* sessions. The first two experiments in the present study investigated exploratory (& other) behaviour in the laboratory rat during *fixed-interval* (FI60s), *variable-interval* (VI60s), *variable-ratio* (VR30), and *differential reinforcement of low rates* (DRL15-s) schedules of reinforcement (& subsequent *extinction*).

The larger and more naturalistic open-field environment extended the repertoire of possible responses. Unexpectedly, extinction of *bar pressing* did not occur more rapidly in the *fixed-interval* groups, and a greater *resistance to extinction* in the *variable-interval* groups was not apparent (Experiment 1). As expected, extinction of *bar pressing* did indeed occur more rapidly in the *DRL* groups, with a *greater resistance to extinction* apparent for the *variable-ratio* groups

(Experiment 2). As expected, more stable post-reinforcement pauses (PRPs) occurred during the predictable *fixed-interval* and *DRL* sessions (high proportions of total frequency & duration measures occurred during PRPs). The unpredictable *variable-interval* and *variable-ratio* sessions lacked stable PRPs (low proportions of total frequency & duration measures occurred during PRPs).

Therefore, even in the larger and more naturalistic open-field environment, the predictions concerning PRP development (or lack of development) on these simple schedules were supported. Thus, some features of operant responding (or the stimuli present immediately after reinforcement) appear to be less affected by the size or complexity of the experimental environment. The findings of this study suggest that the development of PRPs on the predictable FI60-s and DRL15-s schedules appears to be a robust phenomenon (unlike *resistance to extinction*, which appears to be less predictable outside the typical Skinner box). However, it should be pointed out, that a proportion of every behavioural measure did take place outside the PRPs, at other times of non-operant responding throughout the interval.

Experiment 3 investigated exploratory (& other) behaviours in an open-field Skinner box during a *fixed-interval* schedule (FI60s), with a concurrently available water source. It was predicted that the chance to explore novel objects might minimize (or even prevent) the occurrence of "aberrant" behaviours, such as polydipsia. The findings indicate that it is difficult to predict which behaviours will occur excessively in the larger and more complex open-field situation if a water source (& the actual bottle itself) is concurrently available. The FI60s schedule resulted in high levels of *aggressive behaviour* (directed at the stimulus objects & water bottle), but acceptable levels of *drinking* and *escape-directed behaviour*.

Although it is only possible to speculate upon the existence of schedules of reinforcement in zoo or natural ("wild") environments, it is possible that they exist, particularly in zoos where animals are fed at fixed times, or in natural environments where animals are provisioned with food. These human-imposed feeding strategies, may also lead to the development of aberrant behaviours. If zoo animals are housed in traditional barren enclosures and fed according to traditional methods (e.g., every 24-hours), then the 24-hour temporal pattern of stereotypic behaviour (e.g., pacing) observed is similar to the adjunctive behaviours (terminal & interim activities) seen in laboratory animals run on non-contingent, intermittent schedules of food-reinforcement. Zoo managers must be aware of the behavioural effects of such predictable non-contingent feeding schedules.

The final preliminary experiments were conducted at Adelaide Zoo (qualitative analysis only). A number of novel objects (food-related & non-food-related) were presented to a group of six chimpanzees, and a different set of objects was presented to a pair of caracals, in an attempt to facilitate exploratory behaviour and reduce aberrant behaviours. The food-related enrichment devices elicited the greatest levels of exploratory responses in both species- all three food “puzzles” for the chimpanzees, and the “flying-fox” style feeder for the caracals.

Not surprisingly, researchers today are opting for a more integrative approach (e.g., *behaviour systems approach*) to the study of learning and behaviour, combining naturalistic ethological observations with experimental findings, and considering the ecological implications of their findings. Principles of exploratory behaviour can and should be applied to improving both captive environments (e.g., effective behavioural enrichment) and the management of protected areas (e.g., adequate size of the home range for all the populations within a protected areas & effective reintroduction programs). Laboratory studies have already provided valuable information about effects of rearing animals in impoverished or enriched environments. Zoo studies can provide information about behaviour in naturalistic enclosures. Field studies should determine which factors are the most ecologically relevant and which behavioural traits must be performed efficiently. This thesis concludes that a comparative and integrative approach to the study of exploratory (& other) behaviour across environments is both possible and desirable.

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