FILIAL IMPRINTING AND ASSOCIATIVE LEARNING: SIMILAR MECHANISMS?

by

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SUMMARY
This paper reviews a series of experiments designed to investigate whether features characteristic for associative learning are also true of filial imprinting. Phenomena resembling blocking and overshadowing in associative learning may occur during imprinting on two different objects, but it is unlikely that the underlying mechanisms are similar to those in associative learning. Potentiation, a phenomenon the converse of overshadowing, was found in experiments on learning about two features of one imprinting object. This result can be explained in an associative way, but differential levels of arousal or attention are also possible explanations. It is concluded that filial imprinting and associative learning are not one and the same process, although they possibly share one or more subprocesses.

KEY WORDS: Gallus gallus, attachment, filial imprinting, associative learning, blocking, overshadowing, potentiation.

INTRODUCTION
Under natural conditions young animals of many species form a strong social bond with their mother. The formation of this attachment has mostly been studied in young precocial birds such as ducklings and chicks. Precocial birds are characterized by their ability to walk soon after hatching. When the mother hen is present, chicks spend a considerable amount of time close to her, often emitting soft twitters. They tend to follow the parent everywhere. When a chick is separated from the mother and siblings, eating, drinking, and comfort behaviour such as preening disappear, and shrill (‘distress’) calling becomes the predominant activity (Salzen, 1967; Kruijt, 1985). This attachment behaviour is referred to as filial behaviour, and the process through which a young bird comes to restrict this behaviour to certain stimuli is known as filial imprinting (Bateson, 1966; Bolhuis, 1991). When a young bird is reared in the absence of its mother and siblings, it may become imprinted on a member of a different species or on any of a wide range of artificial objects.

Even though the first elaborate description dates from over 50 years ago (Lorenz, 1935, cf. 1937), the exact nature of the learning process involved in filial imprinting is still unclear. Lorenz argued that imprinting is a special process, distinct from other forms of learning,
but several other researchers have proposed that filial attachments are formed through associative learning. For instance, Hoffman and co-workers (e.g. Hoffman & Ratner, 1973; Hoffman & Segal, 1983) suggested that movement is an unconditioned stimulus (US) for eliciting filial behaviour, and that the other aspects of the object become associated with movement. As a consequence, these other aspects become conditioned stimuli (CSs), which also elicit filial behaviour. However, the exact nature of the unconditioned stimulation involved in filial imprinting remains unclear, as it has been shown that birds can imprint on objects that do not move or emit sounds (Gray, 1960; Eiserer, 1980). Recently, Bolhuis et al. (1990) suggested that reinforcement is somehow inherently present when a young bird is exposed to a conspicuous object.

The aim of the paper written by Bolhuis et al. (1990) was to evaluate “whether phenomena that typically occur in associative learning paradigms also occur in the context of filial imprinting”. The authors argued that “such an investigation is necessary before considering the possibility of applying theoretical concepts concerning the mechanisms underlying associative learning to the study of imprinting”. In line with this argument, several studies have investigated whether the outcome of experiments on filial imprinting can be adequately predicted or explained by contemporary animal learning theory. Results of these investigations are reviewed in the present paper.

De Vos & Bolhuis (1990) have already applied this approach by investigating whether ‘blocking’, a basic feature of associative learning (Dickinson, 1980), may also occur during filial imprinting of junglefowl chicks. They concluded that their results were consistent with the suggestion that imprinting on a novel object is blocked to some extent when that object is presented in conjunction with a familiar object, to which the animal has been imprinted previously. The experiments reviewed in the present paper were performed to investigate the occurrence of blocking in more detail, and to examine whether ‘overshadowing’, another well-known feature of associative learning (Dickinson, 1980), may also occur. The first series of studies investigated interactions between imprinting on two objects that are simultaneously present, while the second series investigated whether overshadowing occurs during learning about two features of one imprinting object (van Kampen & de Vos, 1991; van Kampen & Bolhuis, 1991, 1993).

LEARNING ABOUT TWO OBJECTS

The first experiment re-examined the occurrence of blocking of imprinting. The experimental design of the study by de Vos & Bolhuis