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Complete Maternal Deprivation Affects Social, but not Spatial, Learning in Adult Rats

ABSTRACT: The effects of maternal deprivation on learning of social and spatial tasks were investigated in female adult rats. Pups were reared artificially and received "lickinglike" tactile stimulation (AR animals) or were reared with their mothers (MR animals). In adulthood, subjects were tested on paradigms of spatial learning and on paradigms involving learning of social cues. Results showed that maternal deprivation did not affect performance on spatial learning, but it did impair performance on the three social learning tasks. The AR animals made no distinction between a new and a previously presented juvenile conspecific. AR animals also responded less rapidly than MR animals at test for maternal behavior 2 weeks after a postpartum experience with pups. Finally, AR animals did not develop a preference for a food previously eaten by a familiar conspecific whereas MR animals did. This study indicates that animals reared without mother and siblings show no deficits in spatial tasks while showing consistent deficits in learning involving social interactions. © 2003 Wiley Periodicals, Inc. *Dev Psychobiol* 43: 177–191, 2003.

Keywords: maternal deprivation; social learning; spatial learning; artificial rearing; maternal behavior

INTRODUCTION

In altricial mammals, the mother and littermates provide a rich stimulus environment that shapes early physiological and cognitive development and later social behavior. Natural variations or active manipulations of the infant–mother relationship have been demonstrated to yield long-term variations in the neurobiology or behavior of the offspring in many species, including monkeys (Berman, 1990; Fairbanks, 1996; Kraemer, 1992, 1997; Maestripieri, Wallen, & Carrol, 1997) and humans (O'Connor & Rutter, 2000; Rutter, Kreppner, & O'Connor, 2001; Scarr & McCartney, 1983; Scarr & Weinberger, 1983). However, not surprisingly, the effects of early experience on

adult behavior have been most intensively explored in rats, where development is rapid, mechanism can be easily studied, and generalizability of effects to other species has been shown (Fleming & Li, 2002; Fleming, O'Day, & Kraemer, 1999).

In rats, early handling consisting of brief daily separation of pup from the mother has consistently been reported to produce robust behavioral effects in young adult rats, including decreased fear-related behavior (Nunez et al., 1995, 1996), and increased selective attention (Weiner, Schnabel, Lubow, & Feldon, 1985). As well, early handling prevents the age-related decline in spatial learning and memory performance in the water maze (Meaney, Aitken, Bhatnagar, & Sapolsky, 1991; Meaney, Aitken, van Berkel, Bhatnagar, & Sapolsky, 1988).

A different type of postnatal, preweaning manipulation, maternal separation (MS), either in a single 24-hr period or repeated 3- to 6-hr periods, is reported to yield multiple long-term effects in adulthood (Pryce & Feldon, 2003). In comparison to unmanipulated animals, animals that experienced single or repeated separations from mother show increased fear-related behavior (Patchev

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