

Attractiveness of Breast Odors to Babies

After reading the title of this chapter you might conclude that this is an odd area of investigation, maybe even trivial to human behavior. The sense of smell is given a great deal of importance in non-human animal interactions, including parent-offspring relationships and mating. Often when we think of odors we think of something unpleasant or something to be avoided. However, the sense of smell may well play a vital role in areas of central concern to the human experience. A body of research has shown, however, that not only do maternal odors play a positive role in relation to their infants, they have been found to be downright appealing to newborns. Maternal odors are likely to be a significant factor in mother-child bonding or attachment (Porter, Balogh, & Makin, 1988). Recent research (Cernech & Porter, 1985; Macfarlane, 1975; Russell, 1976) suggests that breast-fed newborns prefer their mothers' breast or underarm odors to the same odors from unknown lactating females. This phenomenon has not been observed in bottle-fed babies (Cernech & Porter, 1985). Researchers Balogh and Porter (1986) suggest that this difference in response to underarm odors may be a result of the two styles of feeding. Breast-feeding requires close contact with the mother's skin while bottle-feeding may be done while the mother is clothed and without face-to-skin contact. It may also be that breast-feeding mothers produce special odors that newborns can identify. Leon (1983) from research on other animals suggests that such odors may serve to bond babies to mothers. The research by Makin and Porter described in this chapter focuses on whether or not the breast and underarm odors from lactating women are attractive to bottle-fed infants.

John Bowlby (1969) and Mary Ainsworth (1979) have proposed that caregiver-infant attachment during the initial year of life may profoundly impact the later development of the infant. Bowlby's view regarding attachment focuses on patterns of infant behavior (e.g., cooing, smiling, and crying) that serve to promote a strong bond with its caregiver. Attachment is also seen to be a reciprocal relationship in which caregiver characteristics, such as emotion and affect, also plays an important role (Goldberg, MacKay-Soroka, & Rochester, 1994). Other research by the Harlows (Harlow & Harlow, 1962), using infant rhesus monkeys as participants, suggests that the sense of touch, specifically "contact comfort" between infant and mother foster the attachment bond. The process of bonding that occurs between caregiver and infant is likely to be multidetermined like many other significant behaviors. It is therefore important to see how our sense of smell, the ability to detect and recognize odors, may play a vital role in the bond of new born infants and their mothers. This information provided may have significant practical use in guiding new moms in infant care.

A secondary value of the research in this chapter is to show how inventive and clever researchers can be in setting up methods to assess behaviors. Makin and Porter had to come up with some objective methods of determining how attractive breast odors were to two-week old infants. These infants have very limited behavioral repertoires and they don't complete surveys or preference questionnaires. Part of the fun of research is to devise measures to capture significant human experiences.

Method

The participants were healthy bottle-fed infants. In the first experiment both male and female infants were participants. In the three succeeding experiments only female infants were participants. The reason for only using female infants is a result of the findings of the first experiment. Participants in all experiments were approximately equally divided between Caucasian and African-American babies and were between the ages of 12 and 17 days of age.

The infants were placed in a hospital-style bassinet for the research testing. A metal device was attached to the bassinet so that its two end pieces could be positioned close to each side of the infants' face. Attached to the ends of the device were gauze pads that contained the stimulus odor. Infant testing sessions were recorded on videotape.

The breast and underarm odors were collected by giving two gauze pads to lactating women and two gauze pads to adult women who have never had children. The women wore the gauze pads either on both breasts covering the nipple area or on one breast and under one arm. The pads were worn for an eight-hour overnight period and then sealed in separate zip-type plastic bags. The women from whom the samples were obtained were asked not to use perfume or deodorants while the odor samples were being collected.

The infants, age 13 to 15 days, were tested with the odor stimuli in their homes. The infants, who were alert at the time of testing, were placed on their backs with the odor stimuli pads hanging close to their cheeks. The infants were also swaddled to immobilize their arms. The gauze pads were situated so that if the infants turned their heads their noses would be approximately 1-2 cm from the hanging pads. The testing procedure began with the researcher moving the infant's head toward each of the gauze pads to give the infant a sample of each odor. The infant's head was then moved to a position centered between the pads and a timer measured the number of seconds the infants turned to each pad. Each infant was given two 1-min trials separated by a 2-min break. For each infant the odor stimuli were the same except that they were reversed in position on the second trial. The initial assignments of odors to positions were determined randomly. The trials were videotaped so that two raters could assess the duration of time each infant oriented to each pad at a later time. Inter-rater reliabilities across all experiments achieved correlation coefficients between .98 and 1.00. The raters, in reviewing the videotapes recorded the duration of time for both trials during which infants turned toward each pad. Turning was operationally defined as a deviation from a centerline position toward one side or the other.

Experiment 1

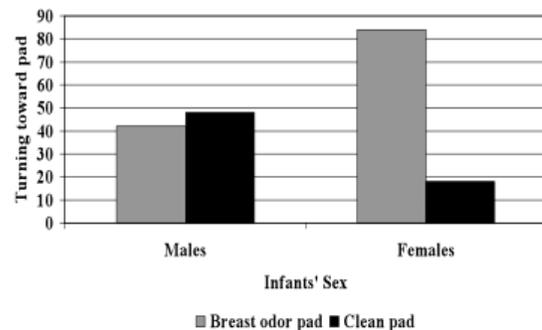
The focus of this initial experiment was to understand how responsive exclusively bottle-fed infants are to breast odors of lactating women who are unknown and unrelated to them. Thirteen male and thirteen female infants participated in this experiment. Using the bassinet described earlier, the infants were tested with gauze pads containing odors from lactating women's breasts or clean gauze pads. Each of the infants was tested with breast odor pads from different women. The women from whom the breast odors were obtained had given birth to their own infants within nine days of the birth of the infants who served as participants in this experiment.

The group mean duration times for male infants were 40.54 sec for lactating female breast odor and 47.31 sec for a clean pad. For female infants the group mean duration times were 84.77 sec for lactating female breast odor and 18.08 sec for a clean pad. As the duration times indicated, female infants demonstrated a significant preference for the lactating mother's pad. No significant preference differences were found for male infants. These results are illustrated in Figure 1. The findings show that female infants had a clear attraction to the breast odors of lactating females whom were unknown to them. Male infants showed no preference between a clean pad and a lactating female's breast pad odors.

Experiment 2

The first experiment demonstrated that breast odors from lactating females were attractive to female infants who were bottle-fed. The researchers, Makin and Porter, asserted that it was possible that the infant girls were responding to the presence of odor over the absence of odor. In order to be certain that the infants were preferentially attending to breast odors, a second experiment was conducted. In this experiment bottle-fed female infants were placed in the same procedural setup as in the first study. This time they were given a choice between the breast odor of an unfamiliar nonlactating female and the breast odor of an unfamiliar lactating female. Since male infants were

Figure 8.1 Experiment 1 – Mean Duration of Turning Toward Pads



unresponsive to the differences in the initial study only female infants were used in this and succeeding experiments. The findings from this experiment are presented in Figure 2. The results indicate that the infants spent significantly more time turned in the direction of the lactating female's breast pad. Although these babies had always been bottle-fed, they were significantly more attracted to the breast odors of lactating women than the breast odors of nonlactating women.

Experiment 3

Cernoch and Porter's (1985) research, noted at the beginning of this chapter, found that breast-fed infants preferred their mother's underarm odor to the underarm odors of other women, lactating or not. The third experiment sought to determine whether or not bottle-fed female infants are more attracted to breast or underarm odors of unfamiliar lactating women. Using the same research format as the previous experiments, female infants were given the opportunity to show preferences by turning toward suspended gauze pads containing each of the odors. The findings are presented in Figure 3. As can be seen, the female infants spent significantly more time with their heads turned toward the breast odor pad than the pad containing underarm odors. This study suggested that bottle-fed infant females preferred the breast odors of lactating females to the underarm odors of lactating females.

Experiment 4

This final experiment was designed to test whether or not odor intensity was responsible for infant preferences in the previous experiments. It is possible that the intensity of the breast odors from milk saturated pads, may be the critical variable rather than the breast odor itself. In this fourth experiment infants were given the opportunity to choose between the underarm pad (high in odor intensity) of an unknown lactating mother and a clean pad (low in odor intensity). The thinking behind this design was that if odor intensity is the important factor guiding infant choices in the three previous investigations, then the infants in this experiment should choose the underarm pad in preference to the clean pad. If there was no preference differences, the infants were not selecting on odor intensity. The experimental method was the same as previous studies. The participants were sixteen bottle-fed girls. The results, available in Figure 4., show there was no significant difference in infant preferences and therefore no indications that the infants were responding to odor intensity.

Figure 8.2 Experiment 2 – Mean Duration of Turning Toward Pads

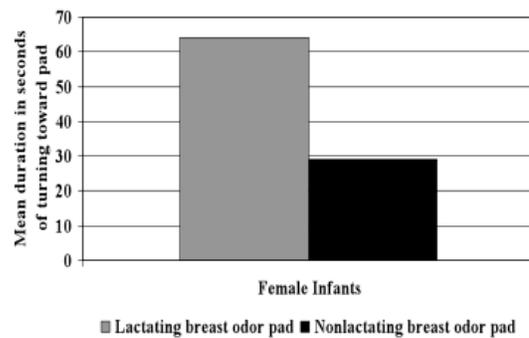


Figure 8.3 Experiment 3 – Mean Duration of Turning Toward Pads

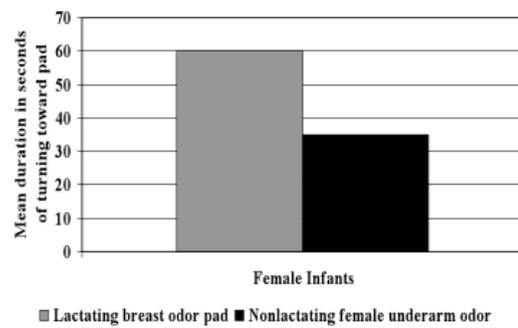
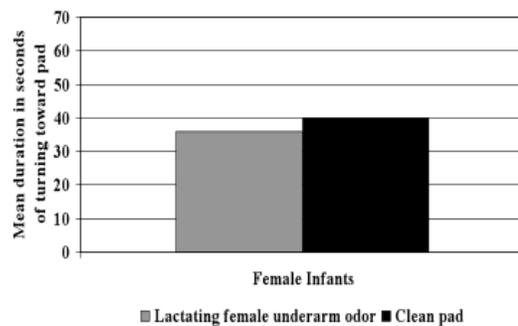


Figure 8.4 Experiment 4 – Mean Duration of Turning Toward Pads



Discussing the experiments

In the initial experiment it was found that female bottle-fed infants preferred gauze pads with breast odors to clean pads. Infant boys, on the other hand, did not demonstrate this preference. Research by Balogh and Porter (1986) found that infant boys preferred to turn their heads toward the right and as a consequence would not sample odors presented on the left as often. Other researchers (Liederman & Coryell, 1981; Turkewitz, 1977) have also found a right turning head preference in some experimental conditions. Coryell and Michel (1978) have suggested such head turning preferences may be associated with handedness. If such were the case, especially with males, the right-turning bias might prevent the male infants from responding to olfactory stimuli. Therefore, the inability of male infants in the initial study to show odor preferences may really not be a lack of ability to discern odors. It is also possible that male infants may have odor detection ability, but at lower levels than female infants. It is interesting to note that olfaction research indicates that females, at ages that range from childhood to old age, have significantly better odor detection ability than males (Doty, 1981; Doty, Shaman, Applebaum, Giberson, Sikorski, & Rosenberg, 1984). The next step in looking at gender differences in odor discrimination among young infants would be to utilize a dependent variable that does not require the head-turning response but still taps odor preferences. The search for such a response in a two-week-old infant is likely to be challenging since the available repertoire of behaviors is limited.

The findings of the second experiment, infant preferences for breast odors of lactating versus nonlactating women, suggest the possibility that odors from lactating women are attractive to infants. Steiner (1977) found that newborns are sensitive to food odors and can react differentially with various facial expressions denoting approval or rejection. In addition to breast odors being connected with milk as a food source, lactating women produce sebum, a substance found on the skin (Burton, Shuster, Cartledge, Libman, & Martell, 1973). Researchers (Nikolaides, 1974; Shorey, 1976; Epple, 1980) have discovered that sebum is significant for olfactory communication in animals. Burton et al. (1973) reported that sebum production increases late in pregnancy and is seen in higher rates in lactating females than nonlactating or nonpregnant women. Additional research has shown that breast-fed infants can identify the unique odor pattern of their own mother (Cernoch & Porter, 1985; Russell, 1976). This ability would be adaptive in helping the infant to locate and latch on to the nipple and, as a result, to nurse effectively. The survival of an infant who is attracted to the breast by odor would not only benefit from the nutrition provided by breast feeding, but also would benefit positively from the mother-infant bonding relationship (Bowlby, 1969; Schaffer, 1971).