Early Child Development and Care, 1996, Vol. 121, pp. 49–54
Reprints available directly from the publisher
Photocopying permitted by license only

Carrying Position Influences Infant Behavior

TIFFANY FIELD, JULIE MALPHURS, KIRSTEN CARRAWAY and MARTHA PELAEZ-NOGUERAS

Touch Research Institute,
University of Miami School of Medicine

(Received 14 March 1996)

Three-month-old infants were carried by their mothers in a soft infant carrier designed for infants being faced inward or faced outward. A within subjects comparison of these two positions revealed that when the infants were carried facing-in, they spent significantly more time sleeping and were rarely actively awake and looking at the environment. In contrast, the infants were more active in the facing-out position including more time moving their arms, head turning, kicking and looking at their environment.

CARRYING POSITION INFLUENCES INFANT BEHAVIOR

The importance of contact comfort for young infants has been highlighted in a number of studies using vestibular-proprioceptive (Gregg, Haffner and Korner, 1976; Korner and Thoman, 1972) and kinesthetic stimulation (Yarrow, Rubenstein and Pederen, 1975). Generally these forms of stimulation have fostered infant social and emotional development.

Infants carried in soft baby carriers experience both vestibular-proprioceptive and kinesthetic stimulation. Being carried in a soft baby carrier appears to affect positively the infants' behaviors including more smiling, vocalizing and less crying, compared to an infant seat. Hunziker and Barr (1986) reported that infants carried in soft baby carriers cried significantly less at 6 weeks than did control infants. In another study by Anisfeld and colleagues (Anisfeld, Casper, Nozyce and Cunningham, 1990) the babies who were carried in soft baby carriers, versus those carried in infant seats, looked at their mothers less frequently, vocalized less frequently as well as cried less frequently. In addition, the carried infant showed social smiling later than the infant seat infants. The authors suggested that the carried infants had "less need to activate these behaviors than control infants because they were already in close proximity to their mothers". We would expect, however, that the chest-to-chest position of the babies in the soft baby carriers may have been less conducive to looking, smiling and vocalizing to the mother and would also, given the close physical contact, discourage crying. Although most young infants are carried in the chest-to-chest position, a

carrier which also allows the young infant to be facing outward would seemingly encourage more social behavior including looking, vocalizing and smiling.

The purpose of the present study was to compare the effects of these two different carrying positions in a soft carrier designed for both positions ("Sarah's Ride") including the infant facing outward with its back to the caregiver's chest and the infant facing inward, chest-to-chest with the caregiver. The way the caregivers carried the infants in the soft carriers was expected to affect the infants' behavior. In addition to monitoring the infant looking and affect behaviors including smiling, vocalizing and crying, we were also interested in determining how active the infant would be, how much looking at external objects would occur and whether the infant would be more awake and alert in the facing-out compared to the facing-in position. The infants were expected to be more active, more vocal, smile more and be more alert in the facing-out position because the infant would experience more kinesthetic stimulation (from its arms and legs being free) as well as being face-to-face wih the external environment. In contrast, in the chest-to-chest position, the infants were expected to be in sleep states more often. To compare the two carrying positions, a group of 3–4-month-old infants were taken for 15 minute walks in each position, and a within subjects comparison was made between their behaviors observed in both carrying positions.

METHOD

Sample

The sample consisted of 32 3-4-month-old infants (N=16 females) (M = 3.4 months) of lower income mothers (M = 4.3 on the Hollingshead two-factor index) who averaged 27.3 years. The ethnic distribution of the mothers was 66% Black, 28% Hispanic and 6% White. Although 31% of the mothers had used a soft carrier before, none had used the facing-out position.

Procedure

The infants were randomly assigned to the two different carrying positions in two orders, face-out first followed by face-in and face-in followed by face-out. During the 35-minute procedure, the mother carried the infant either face-out or face-in for a 15-minute walk to a snack bar where the mother was served a soft drink. The mother sat and drank the sot drink for 5 minutes and then was accompanied back by research assistant (observer) for another 15 minutes while carrying her infant in the opposite position. The observer walked alongside the mother and coded the infants' behavior on a time sampling unit checklist using 10-second intervals.

The behaviors coded included infant state (sleeping, drowsy, passive alertness and active alertness), affect (positive, neutral or negative based on smiling and vocalizations made by the infant), looking (at mom or at environment) and

Table 1 Operational Definitions of Observed Behaviors (and interobserver reliabilities).

STATES

1. Active awake (.73): Infant's eyes are wide open. Infant is physically active and alert.
2. Passive awake (.63): Infant's eyes are open but infant is relaxed or physically inactive, i.e., little or no body movements. Infant may have a neutral facial expression.
3. Drowsy (.65): Infant is not alert; eyes may be partially closed and infant appears to be falling asleep. The infant is not actively engaged in any motor activities, i.e., viewing environment.
4. Sleeping (.75): Infant's eyes are closed and there is no motor activity, except possibly an occasional muscle spasm. Infant's breathing is deep and rhythmic.

AFFECT

1. Positive affect (.78): Infant is smiling or making positive vocalizations.
2. Neutral affect (.74): Infant makes no positive or negative facial expressions or vocalizations, i.e. infant neither smiles nor protests.
3. Negative affect (.80): Infant is frowning or fussing, e.g. making negative vocalizations such as crying or streaming. Infant may also protest by struggling against or resisting the caregiver.

BEHAVIORS

1. Look at mom (.72): Infant's head turns upward toward the caregiver and eyes gaze at the caregiver.
2. Look at environment (.77): Infant's eyes are open and attention is focused on external objects including everything except the caregiver.
3. Arm movements (.73): Infant moves his/her arms voluntarily.
4. Kicking (.75): Infant moves or kicks legs voluntarily.
5. Head turning (.62): Infant moves head in order to change position or direction of gaze, i.e. to better view the environment.

Note: Kappa coefficients in parentheses.

movements (arm movements, kicking and head turning). These behaviors are operationally defined in Table 1. The observer did not talk during the walk (except during the mothers' soft drink break) to avoid potential confounds related to different amounts of verbal interaction on the two walks.

Inter-observer reliability was conducted on one-third of the observations made simultaneously by two observers. The reliability was calculated using Kappa coefficients to correct for chance agreement and averaged .82 (see Table 2 for individual reliability coefficients).

RESULTS

First, multivariate analyses of variance were conducted on each of the categories of behaviors (affect, sleep/wake state, activity and looking). Following significant MANOVAs, ANOVAs were conducted on the individual behaviors.

Table 2 Mean Percentage Time Behaviors Occurred in Facing-in and Facing-out Carrying Positions.

	Carrying Position				*Effect*
	Facing-In		*Facing-Out*		
	Mean	*SD*	*Mean*	*SD*	*P*
Affect					
Positive	17.7	16.7	18.8	16.7	NS
Neutral	86.2	32.3	75.4	39.5	.05
Negative	.5	1.5	.5	2.6	NS
States					
Active Awake	1.2	1.8	8.3	6.4	.05
Passive Awake	83.4	25.7	88.0	24.7	NS
Drowsiness	3.6	2.8	3.6	2.5	NS
Sleeping	17.3	16.2	.7	2.1	.01
Activity					
Arm Movements	8.4	7.1	17.6	15.1	.005
Head Turning	10.2	10.9	17.4	13.9	.005
Kicking	1.9	1.6	5.6	4.8	.05
Looking					
Looks at mother	.6	1.5	.5	1.5	NS
Looks at environment	4.6	3.2	90.8	24.2	.05

As can be seen in Table 2, no differences were noted between the carrying positions for positive or negative affect, although neutral affect was observed more often in the facing-in than the facing-out position. For sleep/wake states no position differences were noted for passive awake or drowsiness. However, the facing-out position featured more time in active awake and the facing-in position featured more time in a sleep state. The infants were more active in the facing-out position including more time moving their arms, head turning and kicking. Finally, no differences were noted in looking at mother, although the infants looked at their environment more in the facing-out position.

DISCUSSION

The carried infants in the Anisfeld *et al.* (1990) study may have vocalized less and started to show social smiles later than the control infants in part because they were carried chest-to-chest by their mothers, and thus, environmental stimulation was limited. Based on the data from our study the chest-to-chest facing-in position clearly limited the possibilities of the infants being awake, alert, active and looking at the environment. In our study when infants were compared facing-in versus facing-out,

they spent significantly more time sleeping and were rarely actively awake and looking at the environment.

It would seem that if an infant needs sleep, the facing-in position is optimal. In addition, for soothing and calming a difficult temperament or colicky baby, for example, the facing-in position would be optimal. Soft baby carriers (such as the Snugli used in the Anisfeld *et al.*, 1990 study) were apparently designed to encourage sleep in young infants.

A carrier that can be used for both facing-in and facing-out positioning might be more effective, as there are times when infants are not sleeping and may then benefit from being actively engaged with the environment. For example, in the present study, the infants who were carried facing-in were passively awake as often as the infants who were facing-out (passively awake being defined as the infant's eyes being open and the infant being relaxed or physically inactive). The active awake state, however, occurred 8 times as often in the facing-out position. The infant in that state would seemingly be in a state of readiness to be more active and explore the environment while being carried. Being faced inward, chest-to-chest with the mother, provides less opportunity for being actively engaged with the environment.

Anisfeld *et al.* (1990) reported that significantly more of the infants who were carried in a soft baby carrier faced inward were securely attached to their mothers at 13 months of age. Although it may have been appropriate for those mothers to carry their infants in a soft baby carrier faced inward for the first couple of months of life, as was done in that study, we would suggest that after that time and at approximately 3 months (the time our current study was conducted) infants might benefit more from having both experiences, being carried face inward when needing sleep or calming, and being carried outward when showing signs of alertness and readiness to interact with the environment. We would expect, then, that these infants would not only be more securely attached but would show superior exploratory behavior, motor and cognitive development at the one year period. Follow-up research will be needed to determine these long-term outcomes.

Acknowledgement

We would like to thank the infants and parents who participated in this study and the researchers who assisted with data collection. This research was supported by an NIMH Research Scientist Award (#MH00331) and an NIMH Research Grant (#MH46586) to Tiffany Field and a grant from Johnson and Johnson to the Touch Research Institute. Correspondence and requests for reprints should be sent to Tiffany Field, Ph.D., Touch Research Institute, University of Miami School of Medicine, P.O. Box 016820, Miami, Florida 33101.

References

Anisfeld, E., Casper, V., Nozyce, M. and Cunningham, N. (1990). Does infant carrying promote attachment? An experimental study of the effects of increased physical contact on the development of attachment. *Child Development*, **61**, 1617–1627.

Gregg, C.L., Haffner, M.E. and Korner, A.F. (1976). The relative efficacy of vestibular-proprioceptive stimulation and the upright position in enhancing visual pursuit in neonates. *Child Development*, **47**, 309–314.

Hunziker, U.A. and Barr, R.G. (1986). Increased carrying reduces infant crying: A randomized controlled trial. *Pediatrics*. **77**, 641–648.

Korner, A.F. and Thoman, E.B. (1972). Relative efficacy of contact and vestibular-proprioceptive stimulation in soothing neonates. *Child Development*, **43**, 443–453.

Yarrow, L.J., Rubenstein, J.L. and Pedersen, F.A. (1975). *Infant and environment. Early cognitive and motivational development.* New York Wiley.