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Source: *Child Development*, Apr., 1986, Vol. 57, No. 2 (Apr., 1986), pp. 331-337

Published by: Wiley on behalf of the Society for Research in Child Development

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The Ability to Negotiate the Environment: An Aspect of Infant Competence as Related to Quality of Attachment

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CASSIDY, JUDE. *The Ability to Negotiate the Environment: An Aspect of Infant Competence as Related to Quality of Attachment*. CHILD DEVELOPMENT, 1986, 57, 331–337. This preliminary study explored the relation between the quality of attachment to mother and a previously unexamined aspect of competence—"the ability to negotiate the environment"—which includes such skills as those needed to maneuver successfully around toys and furniture, to cross distances and reach for objects without stumbling or falling, and to position oneself in a comfortable and appropriate position in relation to toys during play. Videotapes of 65 18-month-olds and their mothers in Ainsworth's Strange Situation provided the basic data. A checklist was devised for scoring difficulties negotiating the environment during the initial 6 min of free play in the Strange Situation. Quality of attachment, based on the remainder of the same Strange Situation, was assessed by a second pair of coders blind to the hypothesis of the study. Results matched expectations. A 1-way analysis of variance of 3 attachment groups (1 securely and 2 insecurely attached) revealed significant differences, with securely attached infants having the least difficulty in negotiating the environment. These between-attachment-group differences remained significant after controlling for individual differences in overall amount of exploratory behavior. The findings, which must be viewed as preliminary given some methodological limitations of the study, are discussed in light of 3 alternative hypotheses as to what may mediate the phenomenon.

White (1959) defined competence as "an organism's capacity to interact effectively with its environment." When infants become mobile, the issue of effective interaction with the environment takes on new implications: Moving through space, infants must contend with a variety of obstacles to their exploration. Particularly during their second year, they are constant victims of falls and other entanglements as they progress in what I have come to call "the ability to negotiate the environment." This previously unexplored aspect of infant competence is defined here as the ability to move safely through space, to be relatively comfortable in the understanding of the physical properties and boundaries of objects, to be aware of weight and balance, to be careful when testing the limits of one's physical skills, and to begin to foresee the consequences of one's physical actions. This ability is related to what Provence and Lipton (1962) described as "a smooth and frictionless type of motor performance appropriate to an infant's age" (p. 63). The present study explores

the relation between the infant's ability to negotiate the environment and the quality of the infant-mother attachment relationship.

Gross motor delays in development have been linked to a lack of infant-mother attachment in babies who have had no opportunity to form a bond with a mother figure (Provence & Lipton, 1962). Maternal deprivation of this sort, or serious neurological damage, have been considered the principal, if not the only, causes of deviations from what is seen as a maturational progression (Gesell & Amatruda, 1974). However, as conceived here, the ability to negotiate the environment is not the same as the development of gross motor skills, since it includes perceptual, cognitive, affective, social, and behavioral components, and is therefore more a matter of global competence than merely a series of individual motor acquisitions. Arend, Gove, and Sroufe's (1979) description of "broadly conceived competence" as "resourceful, flexible, affectively positive environmental engagement"

Portions of this paper were presented at the meetings of the Society for Research in Child Development, Detroit, April 1983. The author gratefully acknowledges the assistance of Mary D. Ainsworth, Bennett Bertenthal, Elsie Broussard, Christina Mitchell, Rob Roberts, and Ross Spears, whose helpful comments on earlier drafts of this paper improved its quality. Requests for reprints should be sent to Jude Cassidy, Department of Psychology, Gilmer Hall, University of Virginia, Charlottesville, VA 22901.

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(p. 951) is central to this conceptualization: Each moment in the playroom is conceived as a mini problem-solving task in which the space, the baby's own body, the people, and the objects must all be coordinated and negotiated.

When failures to negotiate the environment are thus considered as failures in competence—that is, failures to “control the effect that the infant's environment will have on him” (Ainsworth & Bell, 1974)—there is a substantial body of research to suggest a connection with quality of attachment. For instance, quality of attachment has been linked with social competence with both peers and unfamiliar adults (Main, 1973; Main & Weston, 1981; Pastor, 1981; Waters, Wippman, & Sroufe, 1979), with competence in laboratory free-play and problem-solving tasks (Main, 1973; Matas, Arend, & Sroufe, 1978), and with ego-resilience and curiosity in kindergarten (Arend et al., 1979). Closest to the issues raised in the present study is Hazen and Durrett's (1982) finding that infants securely attached at 12 months explored more actively and with greater spatial and conceptual abilities than did insecurely attached babies when placed in an unfamiliar multiroom playhouse at 2½ years.

Matas et al. (1978) suggested that “from a variety of theoretical perspectives, the well-functioning or competent 12–18-month-old is one who has formed an attachment relationship which effectively supports *active exploration and mastery of the inanimate and social environment*” (p. 547; italics added). This notion underlies the primary hypothesis of this project: Babies with a secure attachment relationship that reflects a history of sensitively responsive care are, in turn, able to respond sensitively to the changing environment and have little difficulty in negotiating it. Specifically, we expected babies classified as anxious/resistant to have the most difficulty, an expectation based on two findings. First, Main (1973), using a measure that concurrently assessed the degree to which the infant responded to the particular characteristics of objects in the environment, found that resistant babies showed the least engagement in their play with toys. Whatever interferes with engagement with toys in play may also interfere with negotiation of the environment. In addition, the lack of experience in engaging the environment through play might mean that these infants had less familiarity with properties of the environment, thus making negotiation of it more problematic. A second relevant lead came from

our pilot study, which indicated that these babies had the greatest difficulty negotiating the environment.

Method

Subjects.—The sample consisted of 65 18-month-old babies who were selected on the basis of the quality of their attachment relationship to mother. The Ainsworth Strange Situation was used to assess quality of attachment. This 20-min laboratory observation (consisting of free play as well as mother-infant separation and reunion episodes), as well as the reliability and validity of quality of attachment classifications derived from this observation, have been described extensively (Ainsworth, Blehar, Waters, & Wall, 1978; Arend et al., 1979; Main & Weston, 1981; Matas et al., 1978; Waters, 1983; Waters et al., 1979).

Babies are classified into one of three attachment categories based primarily on infant behavior during the reunion episodes. Securely attached babies (Group B) show strong proximity-seeking and contact-maintaining behaviors and virtually none of the avoidant behavior characteristic of anxiously attached/avoidant babies (Group A) or the angry resistant behavior characteristic of anxiously attached/resistant babies (Group C). Attachment relationships are differentiated even more clearly by subgroups of securely attached (B1, B2, B3, and B4), avoidant (A1 and A2), and resistant babies (C1 and C2). For purposes of the current investigation, only some of the subgroups were selected for study. The anxious/resistant group was restricted to C1 babies; the characteristic extreme passivity of C2 babies and their lack of attempts to negotiate the environment make the measurement of success or failure not relevant. Both subgroups of anxious/avoidant babies were included. Although the experiences of these babies were assumed to have differed at home, it was expected that they would be similar in negotiation of the environment. In order to highlight comparison of these anxious subgroups with babies assumed to have received the most sensitively responsive care throughout their first year, only secure subgroup B3 babies were examined.

The percentage of anxious/resistant (C1) babies, the babies in whom we were particularly interested, has generally been less than 10% in American samples. Thus, in order to obtain a C1 subsample sufficient to allow empirical comparison with other subgroups, either a very large sample (approximately 200) or a sample pooled from existing samples

needed to be gathered. In light of the preliminary nature of the ideas to be investigated, the latter, more feasible option was chosen. This use of existing Strange Situation videotapes as the sole source of data leads to two important caveats. First, the use of the same session to derive both the attachment and the negotiation of the environment measures may influence the results. Second, there is no evidence that the difficulty negotiating the environment in the first 6 min of the Strange Situation reflects behavior that is characteristic in other situations.

Videotapes of Strange Situation behavior used in this project were obtained from studies conducted by six other investigators. To guard against the possibility that different laboratories may have used somewhat differing classificatory criteria, quality of attachment was assessed by two independent coders blind both to earlier classifications and to the nature of the study. In determining the attachment classification, the coders were instructed to disregard the infant's behavior during the first two episodes (a total of 6 min). Inter-coder agreement on 10 randomly selected tapes was 90%.¹

Of the 65 babies, 17 were classified as B3 (nine boys), 20 as C1 (15 boys), and 28 as A (14 boys). All but 16 were 18 months old ($M = 18.03$, range 16–19.5 months). None had any obvious physical abnormality. The majority (94%) were Caucasian; 65% came from middle-SES families, and the remainder from low-SES families.

Assessment of failure to negotiate the environment (FNE).—The first 6 min of Strange Situation behavior were used for this assessment. It is important to note that the first two episodes of the Strange Situation, consisting of free play with the mother pres-

ent, can be viewed as providing a data base separate from the behavior used to classify the infant's attachment relationship. Indeed, a number of investigators routinely disregard this segment of the observation in making attachment classifications.

A pilot study of 20 babies had suggested a set of 13 behaviors as having face validity in identifying instances in which infants experienced difficulty negotiating the environment. These are listed in Table 1. Only behaviors judged to be accidental were counted. The infant's reactions to the event were not considered.

Coders saw only the first 6 min of free play and were blind to the hypotheses of the study. Two independent teams of two coders viewed each tape, noting (a) the presence of every instance of one of the behaviors listed in Table 1, and (b) the number of 15-sec intervals in which one or more such behaviors occurred. Total number of FNE behaviors and total number of 15-sec intervals in which any occurred provided the two FNE measures used in the study.² The second FNE index was constructed as a more conservative measure in order to guard against the possibility that "chain reactions" of codable events might inflate FNE scores. Inter-team agreement for the first FNE measure, based on agreements/agreements + disagreements, was .97 for 10 randomly selected videotapes. Differences between the two teams were settled by joint conference. There were no inter-team differences for the second FNE measure.

In order to permit examination of attachment by FNE relations unconfounded by individual differences in amount of infant exploratory activity, the total amount of time in which the baby engaged in each of the follow-

¹ Strange Situation videotapes were borrowed from Byron Egeland ($N = 18$), Everett Waters ($N = 10$), Mary Main ($N = 15$), Julia Green ($N = 12$), Patricia Crittenden ($N = 5$), and Ross Thompson ($N = 5$). Without the generosity of these researchers, this project could not have been undertaken. Previous codings for Waters's tapes were unavailable; he lent a random selection of tapes, of which 10 were found to fit into one of the three subgroups used in this study. Thompson was asked to send only all available C1 videotapes from his sample, as sufficient numbers of B3 and A infants had been located. The remaining researchers were asked to lend *all* existing videotapes that fell into the subgroups and the age range used in this study. No researcher was asked to use a particular selection procedure. The present coders disagreed with previous classifications for seven videotapes. Three of these were classified in one of the other subgroups used in this study. Four did not, and were omitted. Interlaboratory agreement for the 59 videotapes received for which previous classification was known was 88%. Playrooms from all laboratories were roughly equivalent in size (ranging from approximately 14×16 feet to approximately 14×20 feet) and equivalent in number and placement of furniture and toys. An ANOVA revealed no differences among laboratories in relation to quality of negotiation of the environment.

² Additional scoring information and detailed operational definitions for both measures are available from the author.

TABLE 1

BEHAVIORS CODED AS FAILURES TO NEGOTIATE THE ENVIRONMENT WITH TOTAL FREQUENCIES OF OCCURRENCE ACROSS ALL SUBJECTS

Behavior	Total Frequency
Loses balance	90
Drops toy unintentionally	29
Accidentally bangs or knocks toy	511
Bangs or knocks mother	10
Allows toy to drop on or hit self	27
Sits, steps, or lies on toy	65
Crawls over toy	5
Plows through toys	6
Hits head	3
Topples from sit/crawl/squat ..	10
Trips, but does not fall	3
Falls	13
Becomes tangled in a toy	0

ing was noted: standing, running, walking, sitting, crawling, squatting, holding a toy, holding a second toy, crying, being near mother, being held by mother, and being held by the stranger. Four additional coders blind to all but the first 6 min of Strange Situation behavior made these assessments. Mean intercoder agreement, established by Pearson correlation across all four coders for nine randomly chosen videotapes, was .92 (range .88–.98).

Results

The data were first examined for sex differences. No significant differences were obtained (a) for the distribution of attachment groups, $\chi^2(2, N = 65) = 3.29$, N.S.; (b) for total FNE scores, $t(63) = 1.08$, N.S.; or (c) for the 11 infant activity variables (assessed by MANOVA). The data were therefore collapsed over sex in subsequent analyses. Although all but 16 of the 65 infants were 18 months old, the relation between age and total failure to negotiate the environment scores was explored with a Pearson product-moment correlation. No significant relation emerged ($r = .16$, N.S.).

A one-way analysis of variance (ANOVA) of the total FNE scores showed a significant difference among attachment groups, $F(2,62) = 3.58$, $p < .035$. The difference between securely and anxiously attached babies (i.e.,

group B3 vs. all others) was also significant, $t(63) = -2.49$, $p < .02$, as was the comparison between groups B3 and C1, $t(35) = -2.67$, $p < .01$.³ The mean and standard deviations of FNE scores by attachment group are displayed in Table 2.

Differences among the three attachment groups are highlighted by a median-split chi-square of FNE scores by attachment group. Whereas only 8% of group B3 infants (3 of 17) had FNE scores in the top half of the sample, this was true of 54% of group A infants (15 of 28) and 60% of group C1 infants (12 of 20), $\chi^2(2, N = 65) = 7.72$, $p < .02$.

There were also attachment group differences for the more conservative measure, that is, the number of 15-sec intervals in which a codable event occurred. An ANOVA showed a difference among attachment groups that approached significance, $F(2,62) = 2.99$, $p < .06$. The specific comparison related to the principal hypothesis of the study showed that resistant (C1) babies had significantly greater difficulty negotiating the environment as compared to securely attached (B3) babies, $t = -2.28$, $p < .03$. Means and standard deviations for this measure are given in Table 3.

Correlations of the 11 infant activity variables with FNE scores were all weak, but three of them achieved statistical significance: stands ($-.26$, $p < .02$), sits ($.22$, $p < .05$), and crawls ($.29$, $p < .009$). A MANOVA of the 11 activity variables showed no significant differences among attachment groups, $F(2,62) = 1.49$, N.S. In addition, ANOVAs of FNE scores by attachment group, covarying for each of the 11 infant activity variables, were performed; significant differences among attachment groups were obtained in every case.

TABLE 2

MEANS AND STANDARD DEVIATIONS OF FAILURE TO NEGOTIATE THE ENVIRONMENT (FNE) SCORES BY ATTACHMENT GROUP

GROUP	FNE SCORE	
	M	SD
Avoidant (Group A)	12.18	(8.34)
Secure (Group B3)	7.88	(3.43)
Resistant (Group C1)	15.05	(10.36)

NOTE.— $F(2,62) = 3.58$, $p < .035$.

³ Attachment groups are referred to as “securely attached,” “anxiously attached/avoidant,” and “anxiously attached/resistant.” The reader should keep in mind that in this study these terms refer to subgroups B3 (secure), A1 and A2 (avoidant), and C1 (resistant).

TABLE 3
MEAN NUMBER OF 15-SEC INTERVALS IN WHICH A
BEHAVIOR CODED AS A FAILURE TO NEGOTIATE
THE ENVIRONMENT IS NOTED, BY
ATTACHMENT GROUP

GROUP	MEAN NUMBER OF INTERVALS	
	M	SD
Avoidant (Group A)	7.43	(3.87)
Secure (Group B3)	5.29	(2.23)
Resistant (Group C1)	7.85	(3.48)
All babies	7.00	(3.50)

NOTE.— $F(2,62) = 2.99, p < .06$.

Discussion

Two aspects of the design of this study make it, of necessity, a preliminary study. First of all, different portions of the same observation were used for both the attachment and the FNE assessment. Infant behavior in the preseparation episodes may influence behavior in the reunion episodes upon which the attachment classification is largely based; thus, the difficulty in negotiating the environment shown by the C1 babies might make them cranky, fussy, and resistant during the reunions. Although this possibility seems unlikely in light of the main body of attachment research, the design of the present study does not provide the data necessary to rule it out. Second, there is no evidence that difficulty in negotiating the environment during the first 6 min of the Strange Situation reflects behavior characteristic in other situations. It is possible that it is the stress of an unfamiliar environment (the first few minutes of play in a laboratory) that prompts difficulty negotiating the environment in certain infants. Whether or not this proves to be the case is of interest, yet interpretations of an association with quality of attachment are similar in either case.

Although our knowledge of the parameters of these behaviors is thus limited, in the present study failure to negotiate the environment was found to be related to quality of attachment as assessed in the Ainsworth Strange Situation. Babies most securely attached (B3) to their mothers had less difficulty negotiating the environment than babies who were anxiously attached. This was primarily due to the contribution of anxious/resistant (C1) babies, although anxious/avoidant (A) babies may also have substantially greater difficulty negotiating the environment than securely attached babies. Failure to negotiate

the environment was independent of 11 infant behaviors that might have accounted for some of the differences among attachment groups. Thus, it is *not* the case, for instance, that securely attached babies have less difficulty because they are held more by mother or hold fewer toys, or that anxious babies have greater difficulty because they run more or sit less.

Being correlational, this study does not address the issue of direction of effects. It is likely that both maternal and infant characteristics play a role in the infant's ability to negotiate the environment, and it is worthwhile to consider several hypotheses concerning how the effect may be mediated. Clinical observations suggest that the direction of effect is from the mother to infant. For instance, Anna Freud (1965) has suggested that the mother's interest in the infant's body may be an important factor: "Marked disinterest of the mother in the infant's body and his developing motility may result in clumsiness, lack of grace in movement, etc." (p. 87). Similarly, following observations at the Hampstead Clinic, Joyce Robertson formed the hypothesis that "there is a connection between deficient mothering and disturbed motor development" (1962, p. 247).

Neither Freud nor Robertson have described the process through which "deficient mothering" might contribute to difficulty in negotiating the environment. One possibility is that consistent and contingent mothering facilitates the baby's understanding of cause and effect, which is an important component of successful negotiation of the environment. Lewis and Brooks (1978) suggested that once contingent events are experienced through social interactions, the infant can transfer this understanding to the physical world: "Thus, having acquired circular reactions with the social world, the intention residing originally with the adults, the infant can proceed to intentionally manipulating its inanimate world so as to cause new events to occur. Intentional, instrumental behavior develops from intentional social contingencies rather than from accidental discoveries of contingency in the inanimate world" (p. 212). In other words, the ability to negotiate the environment ("intentional, instrumental behavior") may develop from maternal contingent responsiveness ("intentional social contingencies") rather than from simple physical exploration of the inanimate world. And, just as the experience of contingent responsiveness helps the infant in "manipulating its inanimate world so as to cause new events to occur," so it might

help the infant in manipulating the inanimate world so as to cause successful negotiation of it.

An alternative hypothesis places the quality of the attachment relationship as the principal causal factor, irrespective of the factors contributing to that relationship. Bowlby's attachment theory (1969, 1973) provides a comprehensive theoretical basis for this possibility. Ainsworth has suggested that the infant with a secure attachment relationship can use the mother as a "secure base" from which to explore (Ainsworth et al., 1978). The baby who has built up an image of the mother as both physically and emotionally available is free to attend to other aspects of the environment. By being able to pay more attention to the environment, the infant might have less difficulty negotiating it. According to this theory, an anxiously attached baby, never certain of the mother's availability, spends more time monitoring the mother's actions. Such an infant would thus pay less attention to the environment and might have more trouble negotiating it.

A conflicted preoccupation with mother is clearly evident from the ambivalent behavior of resistant babies during the Strange Situation. These babies mix approach and resistance. Yet some anxiously attached babies show no obvious preoccupation with mother during the Strange Situation, and on reunion are conspicuous for their avoidance of their mothers. However, Sroufe and Waters (1977) found that while avoiding mother, these babies do not show the heart rate deceleration characteristic of true exploratory interest. In addition, the avoidant babies in Ainsworth's sample (Ainsworth et al., 1978) were more likely to cry and follow their mothers at home in the course of daily activities than were securely attached babies. Thus, for both groups of anxiously attached babies, failure to negotiate the environment may be linked to monitoring the mother.

A third hypothesis centers on infant characteristics. Several studies have reported greater neonatal difficulties in babies later classified as anxious/resistant, the very babies who experience the greatest difficulty in negotiating the environment. For instance, Waters, Vaughn, and Egeland (1980) administered Brazelton's Neonatal Behavior Assessment Scale (NBAS) to 100 newborns at 7 and 10 days after birth. Although there were no differences among any of the groups for the testing at day 10, at day 7 babies later judged anxious/resistant were different from the others in many ways, including orienting re-

sponses, motor maturity, and regulatory abilities. These findings are particularly interesting in light of the present findings, because the problems that resistant babies have at 18 months in negotiating their environments are similar to those such babies have as newborns. At both ages they appear less successful in orienting to the environment and in controlling their bodies in space. In a similar vein, two of the four anxious/resistant babies in Ainsworth's original sample (yet none of the remaining 22 babies) had neonatal complications (Ainsworth et al., 1978). In another study, Connell (1976) found that more babies classified as anxious/resistant had had low birth weights and low 1-min APGAR scores than other infants. Thus, the data from three studies have suggested that the neonatal period may be a more stressful time for babies later classified anxious/resistant.

Such neonatal difficulties might contribute to difficulty in negotiating the environment in either of two ways. First, the connection may be a direct physical one. These babies might be innately awkward, inept, and "clumsy." This would account for both the neonatal difficulty and the later difficulty negotiating the environment. These babies might very well be more difficult to nurture, and the strain of caring for them could lead to an anxious attachment relationship. The obverse of this possibility is that the difficulties in caring for such babies contribute to an anxious attachment relationship, and that once this relationship is established it is the lack of a secure base that contributes to the difficulty negotiating the environment (see the second hypothesis outlined above).

The necessity of using a pooled sample and previously existing videotapes limits the conclusions that can be drawn from the findings reported here. A new sample containing a sufficient number of C1 babies would permit separate assessments of attachment and of failure to negotiate the environment—on different days and in different both stressful and nonstressful settings. Such a design would permit further exploration of this issue. It is hoped that the findings reported here may be of theoretical interest and may prompt greater awareness of an important and previously unreported aspect of infant competence.

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