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Social-Conditioning Theory Applied to Metaphors Like "Attachment": The Conditioning of Infant Separation Protests by Mothers*

La Teoría del Condicionamiento Social aplicada a metáforas tales como "Apego": El condicionamiento de las protestas infantiles de separo por la madre

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ABSTRACT

The "attachment" metaphor has labeled a process, of which infant protests during maternal departures have served as a presumably-unlearned index. Within social-conditioning theory, if, and how, such infant protests could be acquired was examined by (a) providing stimuli to the child via routine maternal behaviors (visual, verbal and movement orientations) during mothers' departures and (b) mothers' returns after brief separations. 18 6- to 11-mo. infant-mother dyads were studied in successive sessions. Two treatments were implemented in two orders: 1) CRF-infant protests to departure and separation cues were *always* followed by contingent maternal responses; 2) DRO-cued infant protests were *never* followed by contingent maternal responses. To control for general stimulation effects, the same number and content of maternal stimuli were provided in the two treatments. Individual infant cued-protest rates during both departures and brief separations increased under CRF and decreased under DRO, shifting down from contingent to noncontingent treatments and up from noncontingent to contingent treatments. Results support the assumption that infant protests to both maternal departure and brief-separation cues can be conditioned in everyday settings, trained inadvertently by the social contingencies the caregiver's behaviors provide in the departure and separation contexts in which the protests are found.

DESCRIPTORS: separation protest, attachment, social-conditioning theory, discriminated operant, CRF vs. DRO schedules, laboratory vs. life settings.

RESUMEN

La metáfora de "apego" ha nominado a un proceso, del cual las protestas infantiles durante las separaciones maternales han servido como índice no aprendido. Se examinó,

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dentro de la teoría de condicionamiento social, cómo esas protestas infantiles pueden ser adquiridas proporcionando a los niños estímulos (visuales y verbales) mediante ciertas conductas maternales rutinarias (a) durante su partida y (b) mediante los reencuentros con la madre después de separaciones breves. Se estudiaron 18 diadas infante-madre de 6 a 11 meses de edad. Se implementaron dos tratamientos en dos ordenes: 1) RFC-las protestas infantiles a las señales de partida y separación siempre *fueron seguidas por respuestas maternas contingenciales; 2) RDO-las protestas infantiles* nunca *fueron seguidos por respuestas maternas contingentes. Para controlar los efectos generales de la estimulación, se dieron el mismo número y contenido de estímulos maternos en las dos condiciones. Las tasas de protestas infantiles tanto durante las partidas como durante las breves separaciones aumentaron durante RFC y se redujeron durante RDO, en ambos ordenes del tratamiento. Los resultados apoyan la suposición de que las protestas infantiles de separación pueden ser condicionados, en los ambientes cotidianos, inadvertidamente por las contingencias sociales proporcionados por la conducta de los cuidadores en situaciones de partidos y separaciones.*

DESCRIPTORES: Protestas de separo, apego, teoría del condicionamiento social, operantes discriminados, programas RFC vs *RDO, ambientes naturales* vs *laboratorio.*

Theories based on operant-learning conceptions, such as the social -conditioning behavioral approach (cf, e.g., Bijou & Baer, 1965; Gewirtz, 1961, 1969, 1972a, 1972b, 1977), operate in the frame of functional analyses, with limited a priori expectations. Hence they are focused on issues at the level of what is a stimulus for a response, what is a response to a stimulus, and how stimulus control over particular responses is acquired, maintained, changed, and/or reversed. Gross abstractions may be invoked in such work, typically as labels or chapter headings, but as the exception not the rule. Thus, such terms as "learning" and "discrimination" are occasionally used, but ordinarily only as gross labels for research activities.

Yet loose *metaphoric* abstractions are employed by approaches that come to set the contemporary tone for theory and work in substantial research areas. "Attachment" is such a term, based on the metaphor of "bond" or "tie." The attachment term has been employed heavily in nonbehavioral approaches that are based loosely on the assumptions of ethology, and that emphasize mentalistic cognitive conceptions (Ainsworth, 1971; Ainsworth, Blehar, Waters & Wall, 1978; Bowlby, 1958, 1960, 1969). Much of the contemporary flavor of the work on infant attachment derives from Bowlby's ethological approach, as extended with divergences in theory and method by Ainsworth and her associates. Under these approaches, the attachment label has been used variably to account for the process, the process outcome, the antecedent-consequent relations involved, and/or an underlying "bond" that is said to cause all three.

Hess and Petrovich (in press) and Hinde (1974, 1983) have recently provided an analysis of the ethological context in which the attachment term was embedded by Bowlby (1958, 1969). In a comparative analysis of the approaches to attachment of ethology and of behavior analyses with operant learning, Gewirtz (1961) attempted to organize both imprinting in precocial species and attachment in human infants as learned outcomes. At the same time, he made the case that the two theoretical approaches were not incom-

patible, but complementary, in their concern with unlearned behavior, learned behavior, and the environmental conditions under which those behavior types occur, are fostered, maintained, or inhibited. Gewirtz' (1961) case was made notwithstanding the preference of the ethology of that time for hierarchical explanation and experiments in natural settings, and the preference of behavior analysis for laboratory experimentation and nonhierarchical, molar, outside-the-skin explanation. Differences in unit size and content and in label preferences were considered incidental to the overlaps and commonalities of the two systems.

Since 1961, the tack taken by ethologists, such as Bowlby (1969), Eibl-Eibesfeldt (1979), and Sluckin (1972) in cross-species analyses has involved an increasing emphasis, in an evolutionary context, on the ecological dimensions of behavior with proximal survival contingencies. Further, during that time period some ethologists carried out microanalyses of molar behavior (Gottlieb, 1968, 1983; Hess & Petrovich, 1973; Hoffman & DePaulo, 1977), not unlike those of behavior analysis. Also, in the period being discussed, Skinner (1966, 1981) emphasized the compatibility of evolutionary selection with response selection in operant learning by natural consequences, as did Petrovich and Gewirtz (1984, 1985). In this frame, the behavior-analytic approach is, if anything, even more compatible with ethology today than it was in 1961 (Petrovich & Gewirtz, 1985).

To contribute to the attachment literature on the social relations of infants with the important figures in their lives, and to carry on discussions with mostly nonbehavioral colleagues on the phenomena denoting "attachment", it has become obligatory to employ the attachment term in one's work. Yet, even while the attachment term is employed in some contexts as a label or referent for one's behavioral activities, as in behavioral research generally it remains possible and often advantageous to carry on such work at the level of extrinsic stimulus, response, acquisition of stimulus control, and the like as has been done routinely in the frame of the social-conditioning approach. This tack is illustrated in the present paper with examples from a program of research on protests during separations, as well as on departure protests that have constituted an index of attachment termed "separation protests" (Schaffer & Emerson, 1964). The research to be described here highlights the maternal-behavior cues and contingencies that very likely underlie the acquisition and maintenance of departure and separation protests in life settings.

Social Conditioning and Attachment

As in the ethological approach, in social-conditioning theory attachment has served as a convenient label for a process. However, unlike its usage in the ethological approach, in the social-conditioning approach attachment involves the acquisition of a close reliance, typically concurrent, of one indi-

vidual's behavior upon the appearance and behavior stimuli of another, expressed in a variety of cued-response patterns of the former. The attachment metaphor has served to label this influence process that is denoted by the complex of child response patterns coming to be cued and reinforced/maintained by stimuli provided by the appearance and behavior of an attachment figure/object, in early life primarily the mother, but also the father, siblings, grandparents, and/or servants. The child-response pattern might maintain contact proximity, produce attention, comfort, or the like. In this frame, attachment also has labeled concurrent reflections of the above process, such as the child's differential responding favoring the maternal attachment figure, or by increases in child exploratory behavior in her presence, as well as a child's protests upon a mother's departures (Gewirtz, 1972b). Also, the term attachment may be applied to organize a child's behavior upon its disruption due to rejection by, separation from, or the death of, the attached figure, when that behavior can become highly disorganized and may be accompanied by intense emotional/affective responding (distress) often with a concomitant failure to thrive. The cued response patterns denoting attachment are pervasive and may occur in any segment of the life span, from infancy through late adulthood, and with any interaction partners, for instance mother and child, wife and husband, person and animal, as well as friends or lovers.

In this social-conditioning account, the dyadic functional relations between the discriminative (cue) and reinforcing stimuli from an attachment figure/object, and the child's responses to that figure that those stimuli control, which connote attachment, may involve several object persons concurrently, as well as concurrent directional influence patterns, for instance, mother-to-child and child-to-mother. Moreover, initiations could be maintained if only intermittently reciprocated across occasions by an attachment figure. The discriminated operants denoting attachments are not to be conceived as cross-situational traits. By definition, they are controlled by particular cue and reinforcing stimuli from the attachment object, as well as by contextual stimuli (including setting conditions), so their occurrence will vary across situations otherwise defined (cf., Gewirtz, 1961, 1972a, 1972b, 1978, in press; Gewirtz & Boyd, 1977b).

Separation Protests

The research program here being reported has focused, first, on identifying the conditions that encourage infant departure/separation protests (particularly as such cued protests have served as a prominent index of attachment to the mother) and, second, on developing a procedure parents might use to minimize or preclude behavior problems including distress in their infants either during departures, or after brief separations, from them.

In familiar, everyday settings, there are often found patterns of infant separation protests cued by maternal preparations for distancing, depar-

ting, and/or separating herself from her infant, by actual departures from the infant's vicinity, and by the ensuing short- or long-term separations. In younger children, these protests may be comprised of cries, screams, fusses, whines, and whimpers; in older children, protests may involve grabbing the parent's body or clothing and pleading, in addition to exhibiting elements of a younger-child's behavior pattern.

These cued protests at departure/separation have served at one time or another as the/an index of attachment for several nonbehavioral theorists and researchers. Thus, in a highly influential paper, Bowlby (1960, p. 14) proposed that the infant's responses to, and particularly protests at, maternal departures/separations was the inverse of the proximity-seeking core of attachment. Based on Piaget's (1954) conception of object conservation/-constancy indexed by the object (person) leaving the child's observation field, and on the Bowlby proposal mentioned, a widely-cited report by Schaffer and Emerson (1964) of the age course in the first 18 months of life, and the onset and intensity of infants' focused attachments to their mothers, used measures based on what was essentially a single cued-protest response index of attachment derived from maternal reports. Those measures summarized the reported incidence, intensity, and direction of infant protests after seven types of departure/separations from their mothers and others. Schaffer and Emerson plotted summaries of those measures by monthly age.

To date, little attention has been devoted to the role of the mother in separation-behavior problems the child manifests in differents settings. Understanding the maternal role in separation problems (including infant protests and distress), and procedures to eliminate them, could provide a basis for understanding early child social development and the parent-child interaction process, and for applying these principles/procedures to school and family settings.

As would be expected from their use of a theory that was not learning oriented, Schaffer and Emerson (1964, p. 51) attended only in passing to, and discounted, the possibility that routine maternal behaviors might foster the operant learning of the cued cry/fuss protest response, on which their attachment index was based, in the very departure and separation settings in which their measures were collected. Yet the pattern of infant protests cued by maternal departures may result simply from operant learning, produced by well-intentioned, contingent maternal reactions to those protests in the departure settings (Gewirtz, 1972b, 1977). In particular, the contingent stimuli provided before a mother's departure by such of her responses as stopping, retracing her steps, hesitating, vaccillating, turning immediately to, reasoning with, or returning to hug or pick up her protesting child, could function as reinforcers instrumentally to condition the child's protests to the discriminative cues provided by the mother's preparations to leave, her leaving, and separations from her.

Under this conception, the cued separation protest may well be a proto-

typic learned behavior during the child's socialization that is, at the same time, representative of the pattern of infant responses cued and reinforced by stimuli provided by the appearance and behavior of the mother (or a significant other). In this frame, in the social-conditioning approach the separation protest can serve as one of a number of reasonable indices of infant attachment to the mother as object, insofar as attachment is a metaphoric abstraction for such discriminated operants of the infant under the control of maternal stimuli (Gewirtz, 1972b, 1978).

Reported here are early results from a laboratory study mounted to ascertain if, and how, infant protests can come under the acquired control of stimuli generated by contingent maternal behaviors during departures and after brief separations. In the research here presented, a demonstration that infant protests cued by maternal departures and brief separations can be maintained by contingent maternal responding would provide presumptive evidence for the learned basis of the departure/separation protests that have served as an attachment index in life settings. This demonstration would also detail an important instance of social learning in early life, as well as provide some understanding of the case where the very pattern of maternal responding to the infant's cued protests (that appeals to some conceptions of positive/loving mothering) can generate problems of infant-behavior management that prevent the constructive fostering of developmentally-appropriate infant behaviors. At the same time, this pattern could illustrate how the same maternal responding that controls infant behavior can come under the close negative-reinforcer control of the infant's stopping its behavior contingent on a maternal behavior (Gewirtz, 1977).

The Conditioning of Separation Protests

Research Strategy and Tactics

The research design and experimental procedures employed were focused on maximizing between-treatment differences (effects) while minimizing intrasubject and intersubject differences (i.e., variability). Between-treatment differences were heightened by establishing the two treatments as logical opposites at extremes of the dimension ranging from contingent to noncontingent stimulation. Intrasubject differences were minimized by using a repeated-measures design. Intersubject differences were minimized by using a powerful procedure, including shaping and running each subject under CRF and DRO until a behavioral criterion was attained, so that every infant subject received a maximal dose of each treatment, that would contribute to overriding each subject's unique reinforcement history, thresholds, capacities, and experiences. In sum, the strategy was to implement the treatments and examine the behavior outcomes in a laboratory setting in which relatively-much control was exercised over the proximate conditions thought to

be causal, care was taken to limit the operation of potentially confounding variables, and interindividual and intraindividual differences were minimized. The design used was intended to be highly efficient for the purposes of the present research.

Experimental Procedure

The research procedure involved bringing 18 middle-class infant-mother pairs into the laboratory for successive, typically thrice-weekly, sessions each lasting about 25 min. The normal babies ranged in age from six to 11 months at the start of their being observed, and were selected on the basis of their mothers reporting they were capable of remaining in a playpen for at least 15 min. This screening was used because, in the pilot phase, after noting infant aversion to the playpen in the conditioning procedure and interviewing subject mothers, it was concluded that most of the babies with no playpen history regularly exhibited high-intensity crying when they were placed in the playpen (even one that contained apparently interesting toys). Also, it was noted that "bye bye" plus other departure cues seemed to have little meaning for those same infants, possibly because they rarely had been separated from their mothers in the past.

The infant was placed in 1 meter square playpen, containing several simple toys (e.g., blocks, plastic animals), in the far corner from the entrance/exit door of a pleasant, windowless, 15 meter-long by 5-meter-wide room, with children's paintings on the wall. A small sofa in which the mother sat at the start of a trial was positioned adjacent to the playpen. Two television cameras were positioned in the room, to monitor the expressions and behavior of the infant in the playpen and concurrently of the mother as she sat and then walked from her chair to and through the door, while cueing and responding contingently or noncontingently to her infant's protests. In an adjacent observation room, the synchronized behavior of infant and mother in interaction were displayed on a video monitor in split-screen format, and recorded on videotape. From the observation room, the experimenter could view the mother-infant interaction in the laboratory on the video monitor, as she/he directed the mother's actions via earphone, including the departure signals and the contingent or noncontingent responses to her infant's behavior.

Subsequent observer-reliability determinations and scoring of protests and coding of other responses was done from the videotape records. For the first 5 subjects, median agreement for three pairs of independent observers on the dependent measures was 95 per cent, with systematic improvement on later studied subjects. The agreement value was taken to be adequate for the purposes of this research.

The mother's signal and contingent behaviors were under the close instructional-earphone control of the experimenter. The mother cued her de-

partures from the room explicitly and redundantly 3 times: first, after standing up and waving, she said "Bye bye, I'll be right back", and started to walk slowly toward the exit door; the second cue involved the mother stopping briefly to take her purse, at the same time saying "play with your toys, bye bye", and again walking slowly toward the door; and, third, once the mother had opened the door, she turned to look at her infant, said "be a nice boy/girl, bye bye", and closed the door while exiting the room. Each such departure lasted approximately 20 sec., and was under the moment-to-moment control of a sequence of instructions given to the mother via earphone.

Each infant was subjected to two experimental treatments in the repeated-measures design. In one condition, *contingent* maternal responding (i.e., continuous reinforcement or *CRF*), infant protests to the maternal-departure cues were *always* followed immediately by contingent maternal auditory and visual stimuli provided by her responses (orienting toward the infant and saying "What's the matter baby, Mommy will be right back"), both inside and returning from outside the room. In the other treatment, *noncontingent* maternal responding (i.e., differential reinforcement of other-than-prostest responses or *DRO*), cued infant protests were *never* followed (within 6 sec.) by any class of maternal responses, either while the mother was departing (inside condition) or after she had left the room (outside condition). Nevertheless, the number and content of maternal responses provided were comparable in both the CRF contingent and the DRO noncontingent treatments.

In order to provide the same pattern and density of discriminative stimuli (cues) under the two treatments, a mother would repeat under DRO the same three short statements she would make under CRF and approximately the same number of statements she would provide contingently under the CRF condition, but the latter *never* contingent on an infant protest. If an infant protest occurred under the DRO condition, a mother would wait at least 6 sec. (Ramey & Ourth, 1971) before providing either her cue or alternative response (like the one provided contingently under CRF), to preclude the possibility of adventitious reinforcement of the protest. This procedure allowed control to rule out the possibility that the different effects of the treatments on the child-behavior pattern would be due to differential elicitation/stimulation/arousal resulting from the incidental fact of maternal stimulation and not from the critical contingency itself. Therefore, comparable density patterns of maternal stimuli were presented under the two treatments, inside and outside the room. In addition, the DRO procedure used when the mother was outside the room involved a shaping process to train the infant to tolerate increasing periods between maternal stimulation occasions without protests. Initially maternal stimulation would follow an infant protest by a delay of at least 6 sec. The delay would then be increased at a gradual rate that would not disrupt the infant's nonprotest pattern, until a maximum delay of 3 min. for the mother outside the room

was tolerated without the baby protesting, for several consecutive trials.

In the event a protest did not occur under CRF when the mother was outside the experimental room the maximum time she could stay out was 5 min. on the first trial of each session, and 3 min. on each subsequent session trial. A mother was instructed to return to the room without looking at, or talking to, her infant. Then, a new trial began, after a 30-sec. control period that permitted the experimenter to insure that the baby, who was in the playpen, was in good form and not responding emotionally on unconditioned grounds.

Infant Ss were exposed to the two treatments, CRF contingent and DRO noncontingent, in one of two sequences, AB or BAB: In the AB group, 10 babies served first under CRF and second under DRO; in the BAB group, 8 babies served first under DRO, second under CRF and, third, 7 of these babies served under DRO again. Under both sequences, the final DRO exposure permitted reversal of the rate of cued protests before the infant left the project. A session consisted of between 5 and 7 trials. The mother-infant pairs served in from five to 11 sessions, under each of the two treatment sequences, until infant-protesting criteria were met.

Under CRF, for the outside condition the criteria were at least one protest on every session trial and, for the inside condition, one protest on at least 80 per cent of the trials (for two subjects, 50 per cent of trials with protest was the maximum level that could be obtained). Also, for the inside condition under CRF, < 5 sec. latency on each protest on the last three consecutive trails was required as an additional criterion to switch to the DRO treatment. Under DRO, protests had to be reduced to at least one-sixth or fewer of the total session trials. Even so, it was necessary to shift treatments before these criteria were met in two cases where the number of sessions (under a treatment condition) had reached a maximum of five, and the mothers indicated they could not continue to keep their infants in the research for the number of sessions that might be required.

Results

Results are based on the 18 individual infant subjects. The conditioning records of four infant subjects, two 6-mo.-old females and two 10-mo.old males, are displayed in Figure 1. These individuals are representative of the range of outcome patterns. Preliminary analyses were done on patterns of gross effects for individual subjects using nonparametric Chi-Square tests. The outcome measure used under all conditions was the percentage of trials-per-daily-session (range 4 to 7 trials per session) on which the infant made a cued protest.

In the contingent-responding *first* (CRF1) sequence, *inside* the room, 9 of 10 infant Ss ($X^2 = 6.4$, $p < .02$, 1 df) showed a decline in the percentage-of-trials-with-protests index from the final CRF to the final DRO session,

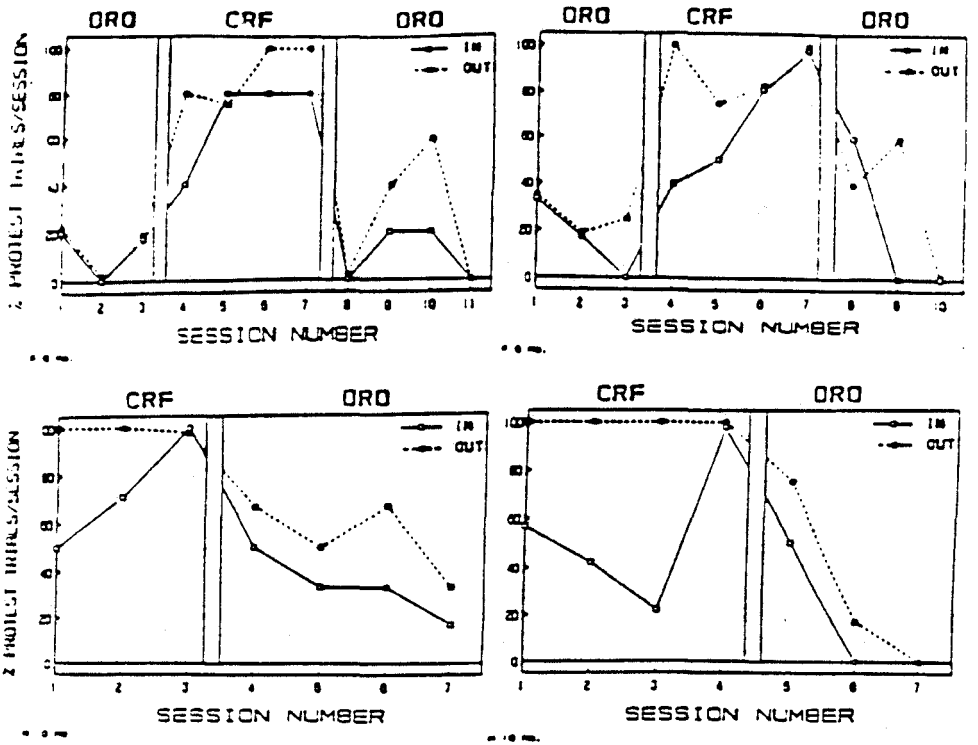

Figure 1. Four representative individual-subject conditioning records showing Percent Protest Trials Per Session under DRO noncontingente and CRF contingent stimulation conditions. The top two graphs chart the cued-protest index of two 6-mo. -old females under DRO-first, CRF-second, and DRO-third conditions; the bottom two graphs chart the cued-protest index of two 10-mo. -old males under CRF-first and DRO-second conditions.

and, *outside* the room, 10 of 10 ($X^2 = 10$, $p < .005$, 1 df) of those infants showed such a decline. In the contingent-responding-*second* (CRF2) sequence, *inside* the room 8 of 8 ($X^2 = 8.00$, $p < .005$, 1 df) infants showed a rise of at least .60 in the percentages of trials with protest from the final DRO to the final CRF session, and, *outside* the room, 8 of 8 ($X^2 = 8.00$, $p < .005$, 1 df) of these infants showed such a rise. In addition, for the 7 of 8 infants of the CRF2 sequence subjected to a second DRO condition series post CRF, 7 out of 7 ($X^2 = 7.0$, $p < .01$, 1 df) showed a decline of at least .60 in the percentages of trials with protests from the final CRF to the final DRO session, both inside and outside the room. A conditioning curve based on the medians of the scores of infants pooled from the two order-of-treatment groups, CRF first and DRO first, is presented in Figure 2. The median pattern clearly connotes that conditioning and reversal has occurred.

In sum, it was found that 17 out of 18 ($X^2 = 14.22$, $p < .001$, 1 df) of the infants *inside* the room, and 18 out of those same 18 ($X^2 = 18.00$,

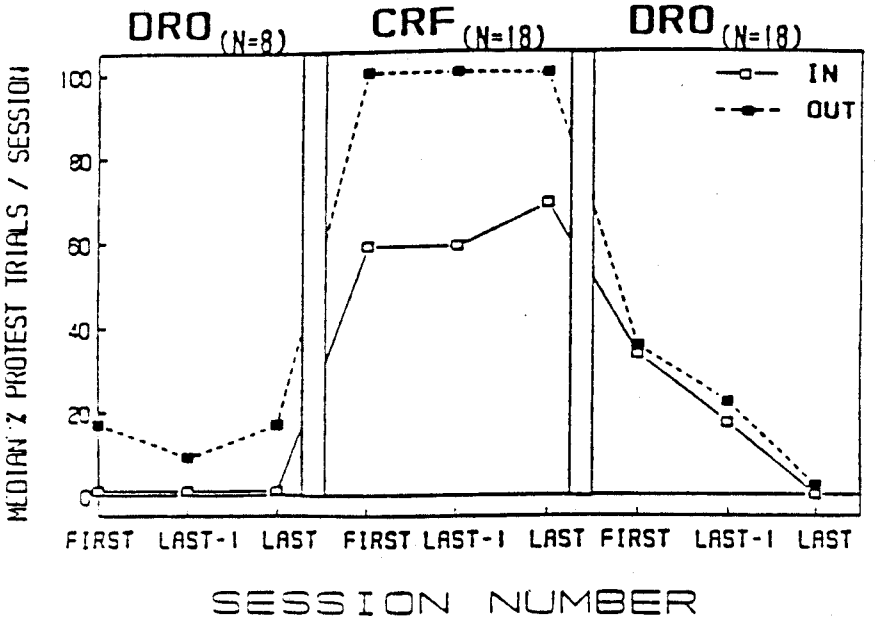

Figure 2. A composite conditioning curve of Median Percent Protest Trials Per Session, across the First, Last-1 (i.e., next-to-last), and Last session score under each condition.

$p < .0001$, 1 df) infants observed *outside* the room, as well as 7 of 7 ($X^2 = 7.0$, $p < .01$, 1 df) of the infants in the second DRO series after CRF2, both inside and outside the room, manifested cued-separation-protest patterns in accordance with an operant-conditioning interpretation: Infant cued-separation protests increased under maternal contingent responding, decreased under maternal noncontingent responding, and shifted downwards from contingent to noncontingent maternal responding and upwards from noncontingent to contingent maternal responding. As was noted, the median pattern of changes manifested by the individual subjects in the aggregate was statistically reliable across treatments.

Using the same gross-change statistical analysis focused on individuals, *no* reliable differences were found in the dependent measure being reported between the AB and BA(B) sequences of CRF and DRO conditions (CRF first or second). By this measure, the order of treatment presentation played no role in the findings. Thus, the result pattern reported supports the assumption that, in life settings, infant protests separately to maternal departures and to maternal separations can be learned, trained by the mother, incidentally to her purposes, in the departure/separation setting itself, and that such protests can be minimized and reversed by eliminating the contingencies that maintain them.

Moreover, under the DRO condition mothers remained outside the room

longer than under CRF and, in most of the cases, without the infants protesting. Thus, the mothers of every one of the 8 infants ($X^2 = 8.0$, $p < .005$, 1 df) showed a decline in the time they remained outside the room from the final DRO-first to the final CRF-second session, and the mothers of 13 of the 17 infants ($X^2 = 4.76$, $p < .05$, 1 df) showed an increase in the time they remained outside the room from the final CRF-second to the final DRO-third session (7 infants) pooled with that from the final CRF-first to the final DRO-second session (10 infants).

Discussion

These early results from our laboratory-research program indicate that it is plausible to assume that, in home settings, the protests at maternal departure or separation of 6- to 11- month-old infants are trained inadvertently by mothers' responding contingent on those infant protests. Put into question is the assumed-unlearned separation-protest attachment index used by Schaffer and Emerson (1964) to chart the age course of attachment in the first 18 months of life. In the 24 years since its publication, the Schaffer and Emerson chart has been emphasized, nearly without exception, in the introductory child developmental psychology textbooks published during that period. For some recent examples, see Hall, Lamb, and Perlmutter (1986, p. 377), Hetherington and Parke (1986, p. 248), Helms and Turner (1986, p. 199), Liebert and Wicks-Nelson (1981, p. 379), Santrock (1988 p. 219), Santrock and Bartlett (1986, p. 296), and Santrock and Yussen (1987, p. 373).

Indeed, in the research reported in this paper (a) protests during departure were conditioned on an operant basis in 17 of the 18 infants and (b) protests after a brief period of separation from the mother were so conditioned in all 18 infants. The infant subjects ranged in age from 6 to 11 mo. As with other demographic-type variables (e.g., culture group, social status, sibling position, geographic location), the *age-in-months* (against which the separation-protest attachment score was plotted by Schaffer and Emerson) is not, in itself, a psychological variable; it must be reduced to inputs variared by the extant psychological theories to function as proper input variables (Baer, 1970; Gewirtz, 1969). Hence, in a process analysis, age could not be considered to "cause" the changes observed. Schaffer and Emerson had reported a rise in separation protests, that they took to denote a focused attachment, within the 6– to 11– mo. age range. The finding we have reported, showing that separation and departure protests can be operant conditioned throughout that age range, is compartible with the logic cited earlier that age is not a proximal causal variable. Further, a corollary of our finding that protests can be operant conditioned is that, by using separation protests to index attachment, Schaffer and Emerson made their conception of attachment hostage to the idiosyncratic factors underlying whether or

not, and how, mothers respond to their infants' separation protests. Schaffer and Emerson did not propose that such idiosyncratic maternal factors had anything to do with their attachment conception or index.

Infant control of Maternal Responding

The emphasis in this study has been on the one-way or unidirectional influence that the mother's behavior-provided cues and contingencies exert over infant protest behaviors. In the laboratory setting employed in the research being reported, the mothers, agents of the experimenters, exhibited invariant behavior under instructions, while the infant's behavior could vary. A one-way influence process was involved. In earlier analyses of free-operant infant *crying* in natural-life settings, it was detailed how a two-way bidirectional influence process is ordinarily involved in mother-infant interaction (Gewirtz. 1977; Gewirtz & Boyd, 1977a). In this process, the concurrent conditioning of the behavior of both infant and caregiver takes place, effected by the impact of stimuli provided by the (behavior of) the one on the response of the other. Whether elicited or operant, infant crying is ordinarily aversive to caregivers, due to its shrill, noxious qualities (Bowlby, 1958; Gewirtz, 1961) or because it could reflect a mystery about the cause of the crying, a parent being impelled to do what would be required to terminate the crying.

At the same time the infant operant crying is conditioned by the positive reinforcement provided by the mother picking up her infant and/or soothing it contingently, those very same maternal responses, could come under the negative-reinforcer control of the infant's crying behavior, when infant crying ceases contingent on such parent behavior as picking up and/or soothing the infant. In natural departure and separation settings, it is assumed that a similar two-way influence process operates: At the same time that infant protests cued by departure preparations and brief separations would come under the control of contingent maternal responses, such as reasoning with the child, backtracking, vacillating, picking it up, or returning to the room, those same maternal responses could come under the negative-reinforcer control of the contingent removal of infant protests (comprised of fusses, whines, and/or cries).

The existence of such two-way influence patterns received some confirmation in this study. Infant high-rate protesting is ordinarily correlated with a high-rate of maternal responsiveness. Under the DRO noncontingent-stimulation series that preceded or that followed the CRF contingent-stimulation series, 15 of the 18 mothers commented spontaneously that they were astounded by the rapid and dramatic decline in the incidence of their babies' protests, that permitted the mothers to remain outside the room for substantial periods. Nearly all of those mothers indicated home patterns of their hesitating or not daring to leave their infants' vicinities for fear that the infants

would emit intensive, lengthy protests. In other words, the contingent maternal behaviors that function as positive reinforcers of the infant protests were under the negative-reinforcer control of those very protests. Furthermore, at home nearly all of those same mothers could not readily separate themselves from their infants by closing a door between them. Hence, those mothers were astonished further by the fact that, under the noncontingent-stimulation DRO condition, ultimately their infants could, without protesting, tolerate functional separation, the mothers remaining outside the experimental room, with the door closed, for lengthy, even increasing, periods across sessions.

Research in Laboratoy vs. Natural Settings

At this point, a comparison of the use of laboratory versus natural-life research designs is in order. A research has been reported here in which preliminary observations of infant separation protests in home settings led us straightaway to the laboratory efficiently to validate the mechanisms abstracted from, and thought to be operating in, the life settings. In this instance, the laboratory approach could be criticized on the basis that it is unusual for mothers to respond uniformly, to every one of their infants' behaviors or immediately contingent on their infants' behavior. On the other hand, a passive-observation study in those natural home settings might have been mounted directly, even a study in which the stimulus context would be held constant and the same constraints and treatments employed as in our laboratory study reported.

This tactic was not used as our first alternative because it is routinely found in nature that the magnitude of effect(s) reflecting the phenomena of interest is small relative to the uncontrolled (error) variation. Hence, passive observation in natural settings with contextual variables uncontrolled ordinarily would give little return proportional to investment. And such observation with a preliminary attempt to control, or stratify for, context also was thought less efficient for our purposes than the laboratory study reported here.

In this frame, the researcher must often consider moving between laboratory settings, in which there is relatively much control of the proximate causal dimensions thought to be operating, little independent-variable variation, and few confounding conditions, *and* life settings in which there may be very limited control and many varying and confounding conditions. This is particulary the case where the researcher intends to make claims about life settings from the laboratory research, as ideally we would like to do here. Ultimately, at least some triangulation will be required between laboratory-generated mechanisms such as those presented here and results obtained from passive observation under the massive inefficiencies prevailing in life settings; This would validate applying the laboratory-generated mechanisms to the life

setting. For the moment, our abstraction of the mechanism from extensive informal observation in home settings, of contingent-maternal responding as the main proximal determinant of infant protests at maternal departures and separations, together with the inherent plausibility of the logic used will have to stand for the triangulation ultimately required until such time as that proximal mechanism would be validated in the life setting.

Conclusions

A laboratory analysis of maternal behavior that can condition and maintain infant departure and separation protests has generated:

1) a basis for understading features of social conditioning in early human life, in particular social-discriminated operants;

2) an instance of early infant social learning, namely of protests cued by departures and separations, and of some proximal environmental conditions apparently responsible for their acquisition and maintenance;

3) a basis for minimizing or eliminating unconstructive infant behaviors, such as departure/separation protests, in this instance by employing noncontingent rather than contingent maternal responding;

4) a suggestion of how the young infant, through negative reinforcement via the removal of its contingent behavior which is noxious for its parent, can acquire control over its parent's behavior (in the present case, that of remaining in the infant's vicinity);

5) an illustration of some problems in, and potential solutions for, bidirectional-influence situations, in particular those involving negative-reinforcement control; and

6) an illustration of the place of laboratory studies in providing leverage over questions and solutions for problems that exist in the real world.

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