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ABSTRACT

This study examined the effect of different types of loss of control on the quality and quantity of the frustration response in 4- to 6-month-old infants. To establish an expectancy, all infants received 4 minutes of contingency training in which infants were presented with slides and music after they performed a pulling response with their right arm. The frustration period, which followed initial contingency training, lasted 2 minutes. Three frustration conditions were investigated. These were: (1) loss of outcome, in which arm responses no longer produced outcomes and outcomes never occurred; (2) reduced control, in which outcomes consistently occurred with every third arm response; and (3) loss of control, in which arm responses no longer produced outcomes and outcomes occurred independently of arm responses. The frustration period was then followed by a reinstatement of the initial contingency. Changes in arm responses and incidence of expressions of anger were the measures of frustration. Results indicated that infants in the loss of control condition exhibited more angry expressions than infants in the other conditions; and, unlike infants in the other two conditions, exhibited a decrease in arm responses. Results suggested that loss of control was a critical determinant of anger in young infants. (MM)

DETERMINANTS OF ANGER IN YOUNG INFANTS: THE EFFECT OF LOSS OF CONTROL

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ABSTRACT

This study examined the effect of different types of loss of control on the quality and quantity of the frustration response in 4-to-6-month-olds. All subjects experienced four minutes of contingent control of slides and music in order to establish an expectancy. This was followed by two minutes of frustration of that control and finally by reinstatement of the contingency. Three frustration conditions were investigated: loss of stimulation, reduction in availability of contingent stimulation and loss of stimulus control. Changes in activity and incidence of anger expressions were the measures of frustration. Loss of control appeared to be a critical determinant of anger. Anger and arm activity were disassociated when infants were exposed to an event which violated their control and was not dependent on arm response.

In earlier papers on anger, we demonstrated that the withdrawal of contingent reward during a brief extinction period frustrates young infants (Alessandri, Sullivan & Lewis, 1990; Lewis, Alessandri & Sullivan, 1990; Sullivan, Lewis & Alessandri, 1992). Increases in the rate of the formerly contingent response and anger expressions (MAX-coded) are observed in such circumstances. Figure 1 illustrates the data of 4- and 6-month-olds from one of these earlier investigations. We have argued that the critical aspect of this event is not the withdrawal of the contingent event itself, but rather, the disruption of the infant's perceived control of an outcome. Almost any change in the contingency which violates the expectancy of outcome might produce frustration. But, if perceived control is critical, then loss of control alone, even with the same rate of stimulation, should also produce anger.

To test our hypothesis, we exposed infants after brief contingency training to one of three types of potentially frustrating conditions: Extinction, Partial Reinforcement, and Noncontingency. Each experimental treatment is operationally defined in the adjoining table (Table 1) in terms of both arm response and outcome. The table also provides an estimate of the conditional probabilities of event occurrence (as described by John Watson). These probabilities define how consistently the arm response produces the contingent outcome (the sufficiency or responsivity of the continency) and how dependent the outcome is upon the prior occurrence of the arm response (necessity or dependence of the outcome) The table shows that each frustration experience (Extinction, Partial, Noncontingent) is distinctly different in terms of the perception of contingency that it affords the infant, and is different from the training period itself.

Under noncontingency as we have defined it, stimulation levels are maintained; the outcome still occurs at expected levels, but is highly independent of the infant's activity. For the Partial group, contingent outcomes are reduced but still obtainable, although at a lesser rate. Moreover, the outcome must always be preceeded by an arm response, so that the dependence of the outcome on that response has not changed. For the Exinction group, access to the expected stimulus has been lost totally and cannot be regained by any means.

HYPOTHESES

Possibility A: Loss of Control Matters.
If, CONTROL is critical, the Noncontingent group will be the most angry. The sudden loss of a predictable contingency between arm activity and outcome while the outcome itself still appears to be available is the source of the frustration. The other two groups will be angry only to the degree that loss or reduction of the outcome's occurrence elicits anger. Since the Partial group experiences less loss of control than the Extinction (See Table 1), we expected this group to be the less frustrated of the two.

Possibility B: Only Loss of Stimulus Matters.
If a withdrawal of stimulation triggers anger, then the Noncontingent group should be the least frustrated and the Extinction group should be the most frustrated. The Extinction group experiences the severest loss of stimulation. The Partial group should be intermediate in both arm activity and anger because stimulation is only reduced. The Noncontingent group continues to receive stimulation at the same level; there is no reduction in stimulus, and therefore no frustration is expected.

Possibility C: Only Violation of the Expected Matters.
If there are no differences among the groups, then anger expressions and increases in instrumental activity are a generic frustration response of the baby to ANY violation of the expected. Simply changing the "rule" in any fashion will result in the same type of behavior changes

METHOD

SUBJECTS. Groups were randomly assigned and were approximately balanced with respect to age and gender. The data presented here are based on those infants from a larger sample who met a criterion of maintaining an average response rate at least 25% above baseline over the training block. (N=24)

PROCEDURE. All infants received four-minutes of contingency training

In which pulling by the right arm resulted in slides and music. The frustration period followed initial contingency training, lasted two minutes and was followed by a reinstatement of the initial contingency. The data presented in the following analyses were averaged over 2-minute blocks for the learning and frustration periods since no minute by minute differences were apparent.

RESULTS

ARM ACTIVITY IN RESPONSE TO FRUSTRATION.

Figure 2 shows the change in arm response from the first contingency block to the 2-minutes of frustration. The data show that the three frustration groups differed in their mean change in arm rate. These differences were signficant by 1-way ANOVA. As can be seen, the Extinction group showed an increased arm rate. Comparison of this response to that observed in other studies shows this increase to be similar to that previously reported by Alessandri, et al. (1990); for example, an increase of 4.8 pulls in the original study vs 6.1 in the present study. The Partial group showed little change in arm response while the Noncontingent group showed a sharp decrease. Differences between groups tested by Scheffe indicated that the Noncontingent group decreased significantly relative to the others but the Extinction and Partial groups were not significantly different.

ANGER EXPRESSIONS IN RESPONSE TO FRUSTRATION

We examined the frequency of MAX-coded anger expressions observed during the frustration block. Since there was no anger response during learning (as is typically observed) these data represent difference scores. Figure 3 shows the means by group. Since the data were not normally distributed, group differences were tested using nonparametric analyses. The data show the Extinction group increased in anger as previously reported (Lewis, et al., 1990; 3.8 anger expressions observed per minute in past work vs 4.2 in the present study). The Noncontingent group showed the greatest frequency of anger expressions and was significantly different than either the Partial (Mann-Whitney $U=9.5$, $p<.02$) and Extinction group ($U=18.0$, $p<.04$). There were no differences between Partial and Extinction groups in this response.

TABLE 1

EXPERIMENTAL CONDITIONS

	Operational Definition	Sufficiency/ Responsivity	Necessity/ Dependence
CONTINGENCY LEARNING	**CONTROL:** a) Arm responses consistently produce an outcome	95%	100%
	b) Outcome consistently co-occurs with arm responses		
EXTINCTION	**NO STIMULATION** a) Arm responses no longer produce outcome	0	?*
	b) Outcome never occurs		
PARTIAL	**REDUCED CONTROL** a) Arm responses consistently produce an outcome one-third of the time	30%	100%
	b) Outcome consistently co-occurs with every third arm pull		
NONCONTINGENT	**NO CONTROL** a) Arm responses no longer produce an outcome	0	0
	b) Outcome occurs independent of arm responses		

*From babies' perspective, necessity is unknown since the determining event (slide and music) never occurs.

FIGURE 2

Response Change
by Frustration Condition

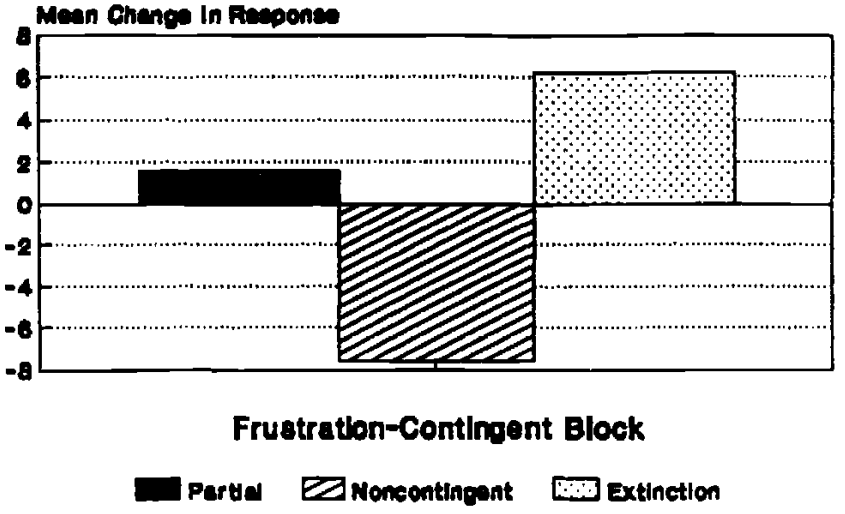

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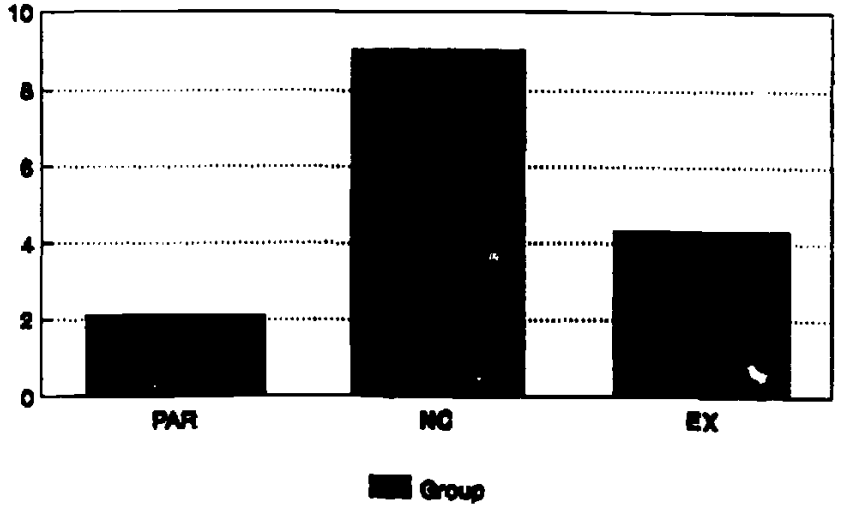
FIGURE 3

AVERAGE AMOUNT OF ANGER
DURING FRUSTRATION BY GROUP



N=24 Crit ge 1.26

DISCUSSION

The data suggest that loss of control alone is an important trigger of anger in young infants. When infants between 4 an 6 months lose control of an event they respond with decreased pulling and increased anger expressions. This decrease in arm rate and increase in anger is significantly different from infants who experience loss of the outcome altogether. Infants who lose control are those who experience a change to a context in which the still occurring outcome is no longer responsive to their action and independent of it (Sufficiency and Necessity both have zero probability). They show a different pattern of response than those infants (Extinction Group) who experience the total loss of outcome. In this case, the outcome is no longer responsive to them, but necessity is unknown because the outcome no longer occurs. The data from the Extinction group parallel and replicate that from our earlier studies with different subjects. It is clear from the facial data that anger is greater in the group of infants who lose control of the pairing between response and outcome.

The Partial group did not differ from the Extinction group although the Partial group appeared, at least by the mean data, to be less frustrated. We can argue this is the case because they could still access the outcome although not as easily. Partial reinforcement is typically associated in the animal literature with response maintenance although it is harder initially to acquire a response on such a schedule.

Why did the Noncontingent group show significantly more anger but significantly less armpull than the extinction group? We believe that that this group, unlike the Extinction group, rapidly learned that armpull was not effective in the frustration situation. Since we know that contingencies are detected in 2-3 minutes, it is possible that they learned that arm responses no longer had the expected effect, leading to a strong decline in arm activity. Why then the anger increase? An increase might occur for one of two reasons. First, an uncontrolled outcome is more frustrating than one that has ceased. It is easy to imagine this if one assumes the perscpective of the infant. Under noncontingency, the infant at times pulls and the outcome fails to occur (the same experience as extinction); at other times the infant has not

pulled and the outcome pops on contrary to what has been expected, in a sense teasing the infant. In this sense, noncontingency after contingency experience is a double violation of expectancy and the greater frustration can be understood as additive. A second possibility for the greater anger in response to noncontingency is that decreases in instrumental response may lead to a corresponding increase in facial response in a kind of hydrolic model of frustration. This type of negative relation between facial expression and activity is observed in slightly older infants who appear more facial wary of strangers when restricted in their infant seats than when they can roam freely about the laboratory.

We conclude that the greatest frustration and the most facial anger results from loss of control rather than from loss of the outcome. In fact, the frustration observed for the Extinction group may result from the shared feature of both conditions, the drop in responsivity in both the Extinction and Noncontingency treatments (See Table 1). One could argue that the loss of responsivity component in the Extinction situation rather than from outcome loss per se is what triggers the anger response. Indeed, there is some support for this since the Partial group which also experiences a loss of responsivity, although less severe, is associated with anger not significantly different from that of the Extinction group. Loss of object alone, apart from its contingent or responsive stimulus features, may be frustrating but should be so only after children can cathect on an object. The latter may occur somewhat later in development. Even in early infancy however, emotion and instrumental behavior are governed by infants' perceptions about what has changed in relation to prior expectancy:

- If you aren't getting what you expect, try harder--at first-- to get it back.
- If you're still getting it, but less consistently, hang in there.
- If it appears when you don't want it, and not when you do, stop trying and get angry!