spring and diagnosis of the mother is reported. I studied 26 pregnancies where the mother became psychotic during the 1st month after delivery (Table 2). Twenty-two were associated with delivery of a male and four with delivery of a female. These data suggest a causal relation between the birth of a male child and a postpartum schizophrenia. I believe postpartum schizophrenia to be a release phenomenon, secondary to birth of the male fetus and to the withdrawal from the mother of the male hormonal influence. Successful treatment of postpartum psychoses with progestins (*8*) and androgens (*9*) indicates that this hormonal influence may involve both progesterone and testosterone.

Reports by Keeler *et al.* (*10*), who describe an acute schizophrenic-like episode in a patient after the abrupt withdrawal of Enovid, and by Delay *et al.* (*11*), who report specific endometrial pathology associated with postpartum psychoses, lend validity to these clinical trials and to the concept of a hormonal deficiency in postpartum psychoses.

My data may indicate that the onset of schizophrenia in the mother is an initiating event. If the mother is acutely schizophrenic during the 1st month of her pregnancy, the male fetus succumbs, whereas if the onset of schizophrenia occurs later in the pregnancy, the fetus may physiologically "defend" itself by the production of functionally high hormone levels (progesterone, testosterone) which suppress the disease in the mother, perhaps by (i) preventing the production, or (ii) enhancing the breakdown of a toxic blood factor in the schizophrenic mother. Delivery of a male fetus unmasks the mother's schizophrenia, with an effect similar to that of abrupt withdrawal of a neuroleptic drug.

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Positive Contrast in the Runway Obtained with Delay of Reward

Abstract. *The failure to find positive contrast effects in the runway may be attributed to a ceiling effect that can be overcome with the use of delay of reward. Rats were trained one trial a day in a runway with small, medium, or large reward. When a shift to large reward was combined with delay of reward, shift groups slowed down less than controls.*

Several lines of evidence suggest that the effect of a given magnitude of reward is not a constant but depends on the range of alternative rewards the subject has received (*1*). A typical procedure for demonstrating this effect is to stabilize an animal on one magnitude of reward and then shift it to a different magnitude. Upward shifts that result in the animal's overshooting the level of an appropriate control are called positive contrast. Conversely, downward shifts that result in the animal's undershooting the level of an appropriate control are called negative contrast. Although negative contrast may be more widely found than positive contrast, there is at least one experimental paradigm which regularly produces the positive case (*2*). In the runway, however, there has been a consistent failure to find positive contrast (though the negative case is widely found). We report here a procedure that gives rise to positive contrast in the runway.

The consistent failure to obtain positive contrast effects in the runway when the parameter is the amount of food reward has been attributed to a possible ceiling effect (*3*). If large reward produces the fastest possible speed of running, shifting a group trained on small reward to large reward could not result in a speed greater than that of a control trained continuously on large reward. It has been suggested that the shift be to medium rather than to large reward, which should allow contrast to show itself. This approach has been unsuccessful, however, for reasons that are difficult to assess because the use of medium reward is not a condition that maximizes contrast (*4*).

A different approach involves the introduction of an aversive condition, such as delay of reward, along with the shift in magnitude of reward. Because delay typically results in a slower speed of running, this should assure a submaximum speed and thus allow possible contrast effects to emerge.

The use of an aversive condition to bring out a difference not visible beforehand has been reported in at least one other context (*5*). Two groups of mature rats, one of which had been deprived of food in infancy, were trained with food reward on a position habit in a T-maze; both attained the same asymptotic running speed and percentage of correct choice. However, when shock was introduced on the food side, the food-stressed group slowed down less and continued to choose the food side more than the control. Instead of shock we used delay of reward, which is equally effective in reducing speed of running.

Fifty naive male albino rats (90 days old, Sprague-Dawley strain) were maintained on limited food with free access to water. The rats were divided into three main groups which, after each run in the runway, received one 45-mg Noyes pellet ($N = 20$), four such pellets ($N = 20$), or 22 such pellets ($N = 10$), respectively.

The apparatus was a duplicate of a standard long runway (1.7 m) (*6*). Start, run, goal, and total times were measured by four standard electric timers activated by the interruption of appropriate photocells located 2.5, 33, 108, and 137 cm from the start box; the last photocell was 15 cm inside the goal box.

After 6 days of adaptation to the runway, all subjects were given 41 trials in the runway (one trial a day) by which time running speeds had stabi-

Table 1. Magnitude of reinforcement during training and shift for all groups.

Group	Acquisition		Reacquisition	Shift
	Phase 1 (no delay)	Phase 2 (30-sec delay)	Phase 3 (no delay)	Phase 4 (30-sec delay)
LL	22	22	22	22
ML	4	4	4	22
SL	1	1	1	22
MM	4	4	4	4
SM	1	1	1	4

lized. Thirty minutes after each daily run each subject was fed in its home cage. The home cage ration was adjusted to provide a total of 8 g per day; for example, the 22-pellet group received only 7 g in home cage. Body weights to the nearest gram taken daily revealed only chance differences among the groups.

The second phase of training was a control. Each subject was delayed in the goal box for 30 seconds before receiving the appropriate number of pellets. Delay was introduced at this point, before any change was made in the amount of food, to determine whether the effect of delay would be the same for all groups. After 11 delay trials, the original conditions were reinstated and all subjects were given 35 more trials to restabilize their performance.

Based on running speeds from the last five trials, the one- and four-pellet groups were each divided into two matched subgroups of ten rats each. One subgroup from each main group was then shifted from its training magnitude to 22 pellets; the other two subgroups each received the medium condition of four pellets. The ten subjects originally assigned to the large magnitude continued to receive 22 pellets. After the division into subgroups, the 30-second delay was again introduced, and each subject was then given 21 trials with delay and either a new or an old reward magnitude (Table 1). Each subject therefore received 108 daily trials, in the following order: phase 1, 41 trials without delay; phase 2, 11 trials with delay; phase 3, 35 trials without delay; and phase 4, 21 trials with both delay and, for some, a change in magnitude of reward.

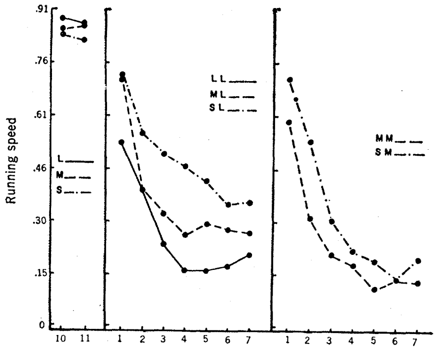

Fig. 1. Running speed (m/sec) is plotted as a function of blocks of three trials for the critical 21 trials during which delay of reward was combined with a shift in magnitude of reward. Left panel, groups shifted to large reward; right panel, the group shifted to medium reward; phase 3, running speeds, prior to shift, of the original groups trained on the three magnitudes of reward.

The main results plotted in terms of total running speeds in blocks of three trials for the critical 21 trials during which there were both delay and a shift in magnitude of reward are shown in Fig. 1. The three groups shown in the left panel of Fig. 1 received 22 pellets during the critical trials; one group was shifted from the one-pellet condition (SL), another from the four-pellet condition (ML) and the last group, the control (LL), was trained on 22 pellets from the outset. The two groups shown in the right panel of Fig. 1 both received four pellets during the critical trials; one group was shifted from one pellet (SM), and the other, the control, was trained on four pellets from the outset (MM).

The introduction of delay along with a shift in magnitude of reward produced the expected decrement in the running speed of all groups. But the decrement was not equal and was instead proportional to the reward magnitude on which the group had been trained prior to the shift. Thus the greatest decrement was shown by the control group which had been trained consistently on 22 pellets, and the least decrement by the group shifted from one to 22 pellets. An analysis of variance performed on total speeds for the crucial 21 trials yielded a significant group effect ($F = 2.77$, d.f. 4/45, $P < .05$). Individual comparisons showed that SL and the combined SL and ML groups differed significantly from the LL control ($F = 7.08$, d.f. = 1/45, $P < .05$; $F = 16.27$, d.f. = 1/45, $P < .01$, respectively), but that neither of the medium groups (ML or SM) differed significantly from their controls ($F = 1.25$, d.f. = 1/45, $P > .05$; $F < 1.0$, respectively) (*7*).

The differences found after the shift are not simply a carry-over of differences obtained before the shift; indeed, they are the opposite of the preshift differences. The group trained on one pellet ran slower than, but when shifted to 22 pellets, faster than any other group (Fig. 1). In addition, the results are not explicable in terms of the assumption that delay itself produced an effect proportional to the original magnitude of reward. A direct test of this possibility was made in phase 2 of the experiment, when delay was introduced for the first time before any shift in the magnitude of reward. Delay produced essentially the same effect in all three groups. For groups L, M, and S the difference between the speeds on the last ten trials of phase 1 and last three trials of phase 2 were 0.61, 0.55, and 0.58 m/sec, respectively ($F < 1.0$).

Accordingly, when delay was introduced before a shift in magnitude of reward, it had essentially the same effect on all groups, but when introduced along with a shift in magnitude of reward, delay produced significantly different decrements in speed. No shift condition was strong enough to overcome completely the decremental effect of delay, but 22 pellets were more effective when preceded by a history of four pellets, and still more effective when preceded by a history of only one pellet. The effectiveness of a particular magnitude of reward would thus appear to depend in part on previously experienced magnitudes, at least when effectiveness is measured against the countering effect of delay of reward and possibly other aversive events. To be sure, in this case contrast consists of a reduction in a performance decrement rather than, as in the traditional case, an increment in the performance level. It is still not known whether the reduction of a decrement can be equated with an increment.

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