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ENLIGHTENING ANOTHER

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BY

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THE HO CHI MINH EFFECT:

THE REINFORCING EFFECT OF

ENLIGHTENING ANOTHER

APPROVED BY

DISSERTATION COMMITTEE

DEDICATION

To my husband Charles B. Williams:
My achievement is his.

ACKNOWLEDGEMENTS

My thanks

- to the many willing subjects who reported for my experiment.
- to the Weiss laboratory group members for their countless suggestions and help in running the experiment.
- to Bijan Rabenou, Richard Feinberg, Mary Mays, Bill Buchanan and especially Frank Miller for contributions to my design.
- to Bijan and Kerry Wyant for help with the statistical analysis.
- to Drs. Jack Kanak, James Kenderdine, Denis Crites and Alan Nicewander for pleasant and valuable association as student and doctoral candidate.
- to Joyce Weiss whose executive ability and great good humor are a constant benefit to "Weiss et al."
- and to Dr. Robert F. Weiss
  who for his student was, is and remains
  "He Who Enlightens."

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The Ho Chi Minh Effect:

The Reinforcing Effect of Enlightening Another

Mary Jane Williams

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Abstract

People can learn an instrumental conditioned response the reinforcement for which is the chance to enlighten another person. Instrumental response speeds were greater when the other person was in trouble than when he was not in trouble. There was a suggestion of both instrumental reward conditioning and instrumental escape conditioning patterns of response to partial reinforcement, depending on the trouble condition. Mere acknowledgement of the subject's enlightening information served as a boundary condition to the effect. These results emerged from a 2 (Trouble) x 3 (Feedback) x 2 (Reinforcement Schedule) design employing 144 subjects.

The Ho Chi Minh Effect:

The Reinforcing Effect of Enlightening Another[1]

Mary Jane Williams

University of Oklahoma

Using the method that Miller (1959) has called an "extension of liberalized S-R theory," Weiss and associates examined the social phenomenon of altruism in seven experimental sorties (Weiss, Buchanan, Altstatt, and Lombardo, 1971; Weiss, Boyer, Lombardo, and Stich, 1973; Weiss, Cecil and Frank, 1973; Stich, 1973). The basic thesis was an idea--novel until that time but implied by previous altruism studies--that altruism should have the functional properties of a reinforcer in experiments that were analogues in every detail to conventional animal-learning experiments. Weiss et al. (1971) and Weiss et al. (1973a), using several instrumental conditioning paradigms, found that human subjects will learn an instrumental response the only apparent reinforcement for which is the delivery of another person from suffering.

All three studies used this basic situation: the subject, looking through a window into a booth, watched another person get "shocked" while he evaluated that other person's "performance under stress" at a steadiness (Weiss et al., 1971) or blip-tracking (Weiss et al., 1973a; 1973b; Stich, 1973) task for a series of trials. The button-pushing response which (the subject thought) recorded his evaluations, shut off the "shock" for the other person for 10 seconds.

The investigators found that altruism does indeed reinforce: the speed of the button-pushing response--when followed by the 10-second reprieve for the other person--increased, in the course of 24 trials, significantly more than it did when the other person was performing the task without shock (no-shock control, Weiss et al., 1971) and significantly more over 15 trials when the other person performed the task with shock from which the instrumental response brought no reprieve (no-reinforcement control, Weiss et al., 1973a). And delay of the reprieve for a few seconds after the response (Weiss et al., 1971) significantly affected the learning curve over the 24 trials: it was slower both during acquisition and at asymptote than with immediate reinforcement. This increase in response speed over trials (acquisition) and an acquisition speed greater with immediate than with delayed presentation of a possible reinforcer are both evidence that a social event does function as a reinforcer (see Weiss, 1968). Moreover, when Weiss, Cecil and Frank (1973) used more than one interval of delay, they found a delay of reinforcement gradient like that found with conventional reinforcement (e.g., Fowler and Trapold, 1962): speed decreased proportionately with an increase in the time (0 seconds; 1 second; 2 seconds) between the response and the shutting off of the shock to the other person.

Given the principle that the greater the magnitude of reinforcement, the faster the speed of the response--whether the reinforcement be differing amounts of food (reward) or escape from differing intensities of shock (escape)--Weiss et al. (1973a) designed the reinforcement to be, for one group, complete reduction of shock to the other person after the instrumental response; for another, reduction from painful to uncomfortable shock; and for a third, no reduction at all (no reinforcement). They found that the greater the magnitude the faster was the response speed just as with animal learning experiments.

Weiss et al. (1973a) also used paradigms that serve to give information about the positive or negative nature of the reinforcement. They found that their reinforcement was like cessation of shock in instrumental escape conditioning rather than like food to a hungry organism in instrumental reward conditioning. That is, both types of conditioning have the same drive-cue-response-reinforcement sequence. In an experiment that is a social analogue to that sequence, it is only a guess whether a possible social reinforcer (like altruism) is appetitive or aversive until the experiment yields a learning curve that is distinct to one or the other. For instance, when a rat presses a lever to escape shock to its paws in escape conditioning, the administration of the reinforcement of shock cessation after each response (continuous reinforcement) yields a faster asymptotic response speed than does partial reinforcement (e.g., after every other response). But in reward conditioning the reverse is true: speed of a response reinforced by food to a hungry rat is faster at the very end of the training sequence with a partial reinforcement schedule than with a continuous one. (cf. Figure 1A and Figure 1B)

Thus, while an increase in speed of response followed by a social event like altruistic behavior is evidence that the event reinforces,

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Insert Figure 1 about here
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the pattern of learning with partial versus continuous reinforcement will tell whether it reinforces by escape or by gratification of some social appetite. The Weiss et al. (1971) partial-continuous reinforcement comparison proved the altruistic behavior in their experimental paradigm to be essentially an escape, since speed with continuous reinforcement exceeded that with partial reinforcement.

Weiss et al. (1973a) also found effects like those obtained with intermittent shock in animal learning. In such experiments, when shock is omitted on some trials (and so, of course, is not reduced), the animal will nevertheless respond with escape behavior; but its overall response speed will be retarded in direct proportion to the per cent of trials on which shock is omitted. Weiss et al. (1973a) had subjects in one group observe the other person get shocked on only 5 out of 15 trials. In two comparison groups, subjects observed the other person get shocked on every trial. For one of these groups, the response always turned off the shock; for the other it never did. The "intermittent shock" group's speed was intermediate between that yielded when the subject's response turned off the other person's shock on every trial and that obtained when the response never turned it off: another demonstration of the aversiveness of the Weiss paradigm (Weiss et al., 1971; Weiss et al., 1973a; 1973b).

Stich (1973) examined the Weiss situation for a possible non-altruistic source of reinforcement: removing the disturbing spectacle of suffering while (perhaps only incidentally) delivering the other person from suffering. Stich reinforced the instrumental response by shutting out--by means of a shutter over the booth's viewing window--the sight of the other person's suffering (which, the subject was told, continued behind the closed shutter) and found that this removal of the spectacle of suffering after each instrumental response was sufficiently reinforcing to produce learning of that instrumental response, although the effect was less than that of actually turning off the shock to the other person.

Although those investigators' reinforcement was negative reinforcement (escape from an aversive stimulus), intuition suggests that some helping behavior should be positive reinforcement. Weiss (Weiss et al., 1973a) notes that Campbell's primary altruistic drive theory (1965) is consistent with altruism as a positive reinforcer, as are "the rather homeostatic concepts of inequity and its restoration" (Weiss et al., 1973a, p. 398). That persons may indeed "hunger and thirst after justice" or other altruistic fulfillment is the basis of this study.

This experiment employed a 2 x 3 x 2 x 6 repeated measures design using the drive-cue-response-reinforcement sequence in an instrumental reward conditioning paradigm, with analogues of drive magnitude, of reinforcement magnitude and of continuous versus partial reinforcement. Since shock to another person has effects analogous to those produced by shock to oneself (Weiss et al., 1971; 1973a; 1973b; Stich, 1973), it was proposed that awareness of another person's deprivation of a resource useful to him, and easily shared with him, might produce deprivation-like effects.

Once "information" was proposed as that resource, elements in the social situation suggested themselves as factors in that situation--possibly acting as boundary conditions necessary to an effect--in the way that "a vacuum" is a boundary condition to the principle about freely falling bodies in physics, or that "*ceteris paribus*" is a boundary condition to the principle relating supply to demand in economics. Possibly, on the other hand, in the relationship this experiment was designed to detect, these elements would act as genuine variables (aspects which, varied consistently, cause consistent changes in the data). Since the particular advantage in modelling is that one gains as predictions the principles already established in the area used as a model (see Weiss, 1968), these elements were proposed not as boundary conditions but as analogues to variables in animal learning. The other person's need of the information, in performing his task (specifically, less or more need) was proposed as a drive magnitude analogue. And the amount of feedback (three levels), the subject got from the other person about his reception and apparent use of the subject's information was presented as a reinforcement magnitude analogue.

A clear analogy to a variation in schedule of reinforcement was giving the subject a chance to inform after each response (100% reinforcement) compared with giving him that chance after 50% of the responses (partial reinforcement).

Method

One hundred forty-four subjects were assigned to twelve experimental cells formed by two need groups, three level-of-feedback groups, and two reinforcement schedules. The two need groups were a) subject in no trouble (NoT--No Trouble); and b) subject in trouble (T--Trouble). The three feedback levels, in increasing magnitude, were c) no feedback (N--None); d) acknowledgement only (A--Acknowledgement); and e) acknowledgement plus continued feedback (F--Full Feedback). The two reinforcement schedules were f) 50% reinforcement according to four random schedules (P--Partial reinforcement); and g) 100% reinforcement (C--Continuous reinforcement). Each cell had eight men and four women.

Apparatus

The subject's room and the experimenter's control room shared a common wall. For experimental trials the subject sat at a table facing this wall, which included windows of transparent mirror glass. The windows were opaque except when illuminated from behind, and instructional signals appeared in each window upon illumination. The signals were the large printed words a) "Listen", b) "Throw Switch If You Wish To Advise", and c) "Talk". A panel mounted on the tabletop contained the subject's instrumental response switch (the classic manipulandum) which was a telephone toggle switch with a spring return, a "Start" button and a "Finish" button to press before and after advising, a microphone, and headphones.

On the experimenter's side of the wall were the controls for turning on the various signals, a cassette tape recorder, headphones for monitoring both the cassette recording used for each trial and the subject's giving of information (during which the tape was interrupted), a microphone, and a stop clock (Lafayette 5720, 1/100 digital readout stop clock) that automatically measured to .01 seconds the subject's response latency (the time-lapse between the signal "throw switch if you wish to comment" and the subject's throwing of the switch which broke the circuit.)

Deception Procedure and Apparatus

In order to mask the learning task so that the conditioning process would not be overridden by the subject's normal use of the higher mental process (Spence, 1966), the experiment was represented to the subject as a study of the effects of limited and controlled feedback on navigational performance. Before the experiment, each subject received this rather elaborate deception: led to a "demonstrator" room, he was seated at a "navigational simulator" somewhat like the one the "other subject" in the experiment would use. The experimenter manipulated the simulator's controls to center a "beacon light" at the centerpoint marked on the rectangular glass window through which one looked. What one saw was actually a motor-driven turntable of wood, inset at intervals around its perimeter with colored glass discs, each of which glowed like a colored beacon light when the moving turntable made it pass over a light fixed beneath the turntable at a point opposite the window. These represented, the subject was told, fixed beacon lights seen from the window of a moving vessel. The controls were to be adjusted to simulate the effort of keeping the craft's "heading" toward the beacon in spite of wind and wave: a clutch which engaged the motor to make the turntable move, and a dial which changed the direction of the turntable's movement. By using these, one could center the light in the window. For this brief demonstration, it was the experimenter who worked the controls. After completing the experimental trials, the subject would return to the simulator actually to take a hand at the controls for four pseudo-trials (data unrecorded).

Concern for the "security" of the cover story about the "other subject" suggested this procedure. The "other subject" (supposedly a recruit--like the subject--from the introductory psychology course subject pool) existed only as a voice on a tape recording. The second simulator, to be used by that "other subject," did not exist either. But prospective subjects, about to participate in the experiment, would be less likely to guess this if at least some of the experiment's veterans, in inevitable accounts of their experiences, would allude vaguely to having worked at a simulator. Hopefully, the real subject would become impressed with the difficulty of the "other subject's" task from this demonstration as well.

Experimental Procedure

After demonstrating the simulator, the experimenter escorted the subject to a room where the subject heard, through his headphones, instructions for the experiment both for him and, he was told, for the other subject who was "seated in a separate room to maintain anonymity." The "other subject" was to operate a simulator unlike the one just demonstrated to the subject. (It had a steering wheel instead of a clutch.) With this wheel the "other subject" was to make a series of attempts to steer to one or another of the distinct beacon lights assigned to him each time by "the Experimenter" (actually the tape-recorded voice of that one of the experimenters whose vocal quality was distinctly commanding).

Over the headphones the subject heard the experimenter issue instructions to the "other subject" to proceed at his task by a seat-of-the-pants sort of piloting--that is, "without instruments." This task would be complicated each time by different factors of wind, waves, and current which, it was said, affected the steering just as they would for a real vessel piloted under those conditions (so that aiming directly at the beacon would be the wrong heading). The "other subject" was to correct for these factors by guess, "feel of the wheel," and trial and error. The precise heading to bring the craft ultimately to the beacon (the course correcting for the three complicating factors) had been carefully calculated. As the "other subject" would attempt to steer toward a beacon, his deviation from this true course would be signalled to the (actual) subject, and only to him, by means of electronic sounds through his headset. (These signals can be described as a steady humming tone for On Course; a fast "beep-beep" for Off Course To The Left; and for Off Course To The Right a slow foghorn-like "ahnnk-ahnnnk."

The instructions explained that data from both subjects were being collected for analysis of the effects of monitoring and feedback performance on the two different simulators which assessed different capabilities. The subject's turn at a simulator (the one demonstrated to him earlier) would be the second phase (the pseudo-trials which followed the actual, experimental trials).

After the instructions, the subject proceeded to the experimental trials, during which he responded to signals on his console and to a sequence of events heard over his headphones. This latter had actually been recorded on a single cassette tape for each trial. (Identical versions were taped with male and with female voice so the "other subject" would always be of the same sex as the subject, as in the Weiss situation--Weiss et al., 1971; 1973a; 1973b; Stich, 1973).

A single trial included these events:

1) The "Experimenter" assigned the "other subject" a beacon toward which to steer as his problem for that "cycle" (the term "trial" being avoided--e.g., "Now find and head for the quick-flashing green light buoy.")

2) The "other subject" made a brief response (e.g., "Ummmm. . . Okay.")

3) The electronic signal's steady hum indicated that the "other subject began on course (except for one trial when he was off from the start). For the Trouble condition, the signal changed to a "beep-beep"

or an "ahnnk. . .ahnnnk" as the "other subject" drifted off left or off right. For No Trouble the steady hum continued.

4) Heard above the electronic signal, the voice of "the Experimenter" began to "read data into the record" which the instructions had invited both subjects to ignore (e.g., "Turning starboard 25 degrees, drift is zero, counter now 38, and we are on green.") Nautical phrases differed with each trial, and being jargon, the end of each phrase could not be anticipated by the subject, who otherwise might make a premature response, throwing the switch before the signal was given. The final words of each phrase, however, served to cue the actual experimenter at the controls--following a script of the jargon--to interrupt the cassette and give the subject the CS signal (cue) for that trial: "Throw Switch If You Wish To Advise."

The time-lapse between the illumination of this signal and the subject's making the instrumental response of throwing the switch was his response latency, the reciprocal (100/latency) of which was the dependent variable measure, response speed. On the nonreinforced trials which the Partial reinforcement groups received 50% of the time, the subject did not receive the "Talk" signal. The instructions had said this would represent a "dead intercom" situation, in which the "other subject" would not hear any proffered advice. A Procedure conventional to animal learning experiments was followed. When the subject did not throw the switch within a criterion time--for this experiment, 20 seconds, latency was considered to be infinite, speed zero, and an unscored makeup trial was given to equalize the number of reinforcements.

(The subject's advice usually followed the pattern suggested by "the Experimenter" in the instructions: a statement like "you are off course to the right." At times the subject gave a command like "Veer left.")

After the subject's advice, the experimenter resumed playing the cassette for all except the no feedback (None) groups. For Acknowledgement feedback the experimenter continued the tape through:

5) The "other subject's" acknowledgement of the receipt of the information. The recorded acknowledgements were variations of "I got the message."

6) For the Full Feedback condition, the experimenter continued the tape past the acknowledgement for another 10 seconds of electronic sounds, which always began with the tone interrupted by the CS signal, and which ended (with the tape and the trial) in the steady hum which signalled, for Trouble groups, "back on course," and for No Trouble groups, "continuing on course." This final segment of signals included more jargon from "the Experimenter," in cryptic comment on the "other subject's" performance (e.g., "In the groove at plus-one, counter 48, switching now to yellow.")

The time consumed by a trial was equal for all feedback groups. For acknowledgement only and no feedback, the experimenter disconnected the subject's headphones from the cassette player, while listening himself to the end of the recording.

Post-Experimental Procedure

At the end of the six trials, the experimenter issued instructions over his microphone to both subjects to wait for the second phase. He then escorted the subject back to the simulator for his pseudo-trials, for which the subject responded to a set of commands like those issued earlier to the "other subject," before being thanked and dismissed.

Results and Discussion

The mean response speeds (100/latency) appear in Table I. A 2 (Trouble) x 3 (Feedback) x 2 (Reinforcement schedule) x 6 (Trials) analysis of variance on mean response speed (Table II) determined that Trouble was a highly significant main effect ($F = 37.62$; $df = 1$; $p < .001$). A Tukey's post hoc comparison (Kirk, 1968) confirmed that the difference between Trouble and No Trouble, collapsed across Feedback conditions, was significant both for continuous ($p < .01$) and for partial ($p < .01$) reinforcement schedules. (A summary of the post hoc values, both critical and obtained, is in Table III). Post hoc analysis of groups at Trial 6 gave some evidence that the Trouble-No Trouble difference could be due entirely to one of the three feedback conditions, and to one cell of that group: the analysis indicated no significant differences between Trouble and No Trouble, either with Full Feedback or with None. But of the Acknowledgement feedback group's four cells (TAC, TAP, NoTAC, NoTAP), two were significantly different from each other. TAC, in which the other subject was in trouble, and gave the reinforcement of his acknowledgement of the advice after each trial (continuously), was significantly different at Trial 6 ($p < .01$) from NoTAC where the other subject was in no trouble and gave reinforcement continuously. When reinforcement was given on a partial (50%) schedule, there was no difference between Acknowledgement in Trouble and Acknowledgement in No Trouble (i.e., TAP versus NoTAP was nonsignificant).

The analysis of variance (Table II) showed that Trouble interacted significantly with Trials ($F = 3.70$; $df = 5$; $p < .01$), i.e., the difference in Trouble and No Trouble increased over trials. And Trials itself was a significant variable ($F = 19.92$; $df = 5$; $p < .001$), i.e., mean speed over all groups increased over trials. Feedback was significant ($F = 3107$; $df = 2$; $p < .05$) but did not interact with Trials, so the differential effect of the kinds of feedback did not increase with trials. Partial versus Continuous schedule of reinforcement was not significant in main effect ($F = 2.42$; $df = 1$; $p < .11$) nor in any two-way interaction with another variable. The four-variable interaction (Trouble x Feedback x Reinforcement Schedule x Trials) was, however, significant ($F = 2.77$; $df = 10$; $p < .01$).

Post hoc analysis of the difference, for each cell, between Trial 1 and Trial 6 indicated only three had significantly faster speeds on Trial 6 than at the beginning: only three "acquired the response." They were TAC ($p < .01$), NoTAP ($p < .01$) and NoTFC ($p < .05$).

The overall main effect for Trials indicates that subjects in this experimental situation will learn an instrumental response the reinforcement for which is the opportunity to enlighten another person: there is an effect.

The difference between the other person's being in trouble and not in trouble, when the subject had the opportunity to enlighten him, created the most striking outcome of this study.

That this Trouble/No Trouble difference was effected only in the Acknowledgement feedback group marks a discovery not of a magnitude of reinforcement effect in the None < Acknowledgement < Full rank order, but rather that one of these three--Acknowledgement--forms at least a boundary condition for the effect, since it was Acknowledgement that produced the striking Trouble/No Trouble difference.

But, more than setting limits within which the effect appears, Acknowledgement seems actually to define the effect. The extra feedback in the Full feedback condition, far from heightening the effect, had nearly as little result as no feedback at all. (Full feedback distinguished itself from None only in the acquisition of the response by NoTFC subjects; the Trouble/NoTrouble difference did not appear.)

This failure of Full Feedback is puzzling since subjects in both the Full feedback and Acknowledgement groups heard on each trial an identical tape--to the point of the acknowledgement of the subject's information. After this the Full Feedback subject heard 10 seconds more of electronic signals. These signals, moreover, always gave a "happy ending" to the trial: the other subject either got out of trouble (Trouble group)--the off-course beeps or honks subsiding to contented hums--or he stayed out of trouble (No Trouble group).

An obvious result of this experiment is the discovery that the essential reinforcer in this enlightenment situation consists in knowing the intended beneficiary received the information to which one is privy--not merely enunciating it in front of a microphone with no idea of its receipt. The subject must know that the information was not only sent but received. (Had the no feedback group [None] shown a clear effect across all need and feedback groups, one could have concluded that the subject found it reinforcing merely to expose his knowledge--since after all he may have considered the information about the other subject's position to be the result of his own quick reckoning; the instructions had mentioned the existence of several turn patterns and possible deviations from true course.)

But to hear, after the acknowledgement, a 10-second confirmation of the information's benefit to the other subject not only did not reinforce more than the acknowledgement, it appears to have cancelled its effect. Why? The answer may lie in the laconic form of the taped acknowledgement. It had been made both brief and near-monotonous in intonation so as to exclude any word of gratitude or pleasure, and any vocal inflection whose cadence could itself convey such feelings (for these--extraneous to altruism--are certainly conditioned reinforcers for human subjects, having been repeatedly associated in the past with natural reinforcers like a pat on the back).

To the subject who, after giving his advice, heard only the acknowledgement and who therefore did not know the fortunate result of his advice, the laconic acknowledgement must not have seemed inappropriate. But the Full feedback subject (in TFC and TFP), becoming aware as trials progressed that his information invariably helped the other person out of his trouble, may have felt that the phlegmatic drone of the other subject's response to his advice was inappropriate. Indeed, he may have felt that he was enlightening an ingrate--a self-cancelling situation. This explanation was suggested by the remembrance of being impressed, at times during the experiment, with the contrast between a subject's sometimes rather enthusiastically offered advice (e.g., "Hey, you're off to the left!") and the dull-toned "reply" of the canned acknowledgement "I got the message"--to which one subject replied with a sarcastic "You are sure as heck welcome!"

That at least some feedback is required--that the effect with None was less than that with Acknowledgement--was not so surprising. Pilot tests in the Weiss magnitude of reinforcement altruism study (Weiss et al., 1973a) made it obvious that the subjects needed an extraordinary cue to discriminate the intermediate magnitude of reinforcement from high magnitude (complete reduction of shock to the other person) and from the no reinforcement level of zero reduction, and thus yield an effect intermediate between the two. That cue was an over-the-intercom reminder from the experimenter, after the subject's response, that shock was reduced from a painful to an uncomfortable level.

An intriguing pattern of results may be seen by comparing Figures 1 and 2, even though the effect shown in Figure 2 did not meet the conventional level of significance. Figure 2 shows, in rolling blocks of two trials per block, the mean speed of the Trouble Continuous and Trouble Partial conditions, and of the No Trouble Continuous and No Trouble Partial conditions for the defining Acknowledgement group.

Examining the Trouble Continuous function and the Trouble Partial function, one notes that they appear to diverge over trials--the Trouble Continuous mean speeds exceeding Trouble Partial mean speeds throughout. This divergence pattern, when juxtaposed with the pattern formed by the same continuous and partial reinforcement functions in standard escape conditioning experiments, shows an analogous shape (Figure 1): the patterns are the same; the functions diverge for both. In the standard escape conditioning experiment, partially reinforced subjects do respond more slowly than the continually reinforced throughout the learning trials. (This is the pattern which other learning-modelled altruism experiments yielded--Weiss et al., 1971; Weiss et al., 1973a; 1973b--and which led those investigators to define their reinforcement of turning off shock to another person as essentially an escape).

Turning to the No Trouble Continuous versus Partial functions in Figure 2, one sees that the continuous function exceeds the partial only until the second block of trials, when the partial reinforcement speed begins to surpass that of continuous reinforcement: the functions cross, though they are not significantly different at Trial 6. This pattern looks like that generated by appetitively-motivated subjects in standard reward conditioning experiments (shown in Figure 1). Here is a pattern analogous to another standard conditioning effect.

This juxtaposition of the continuous and partial functions of the two different need groups with the same functions generated by two different drive/reinforcement paradigms is telling. The joint correspondence of the Trouble partial/continuous and No Trouble partial/continuous functions to those functions with escape and reward conditioning, respectively, is highly suggestive, even without the a conventional level of significance. It is probably aversive to the subject when the other person is in trouble--whether having difficulty with a task or getting shocked. That with No Trouble the functions should assume patterns analogous to those yielded in reward conditioning is a hint of that positive altruism which this experiment sought, and which another experiment might definitively detect.

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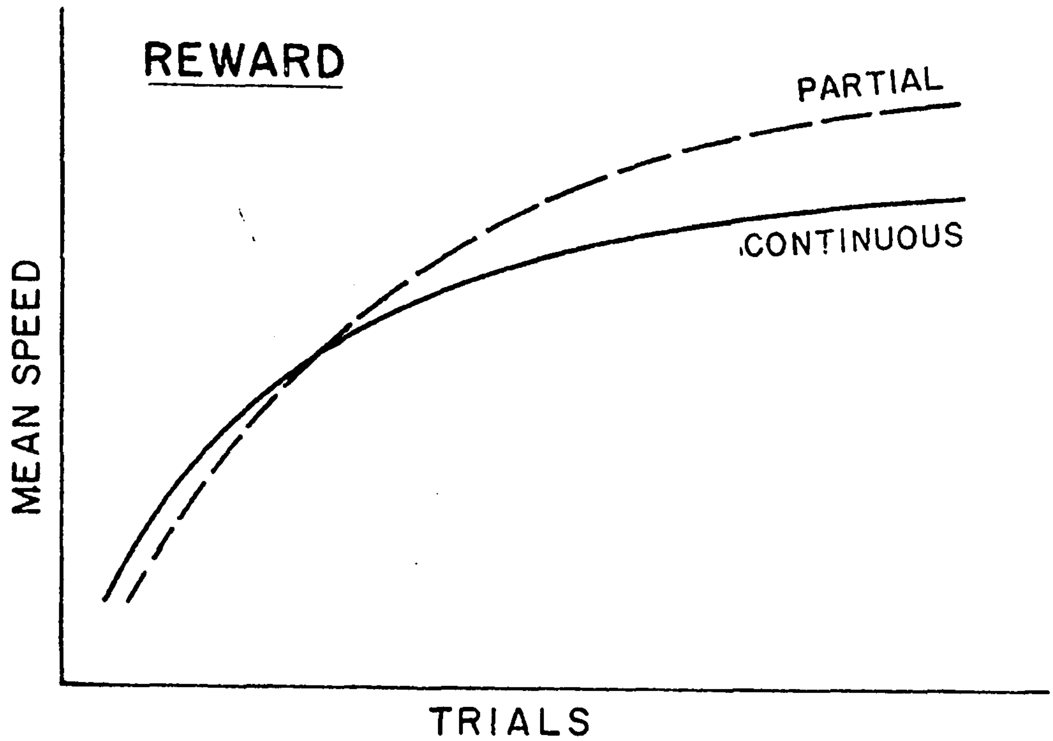
FOOTNOTE

[1]This study was known from its inception as Ho Chi Minh which means, literally, "He Who Enlightens." Our choice of a name which was the _nom de guerre_ of a Communist leader of course conveys no enthusiasm for totalitarianism, but a delight with the aptness of the name for this study.

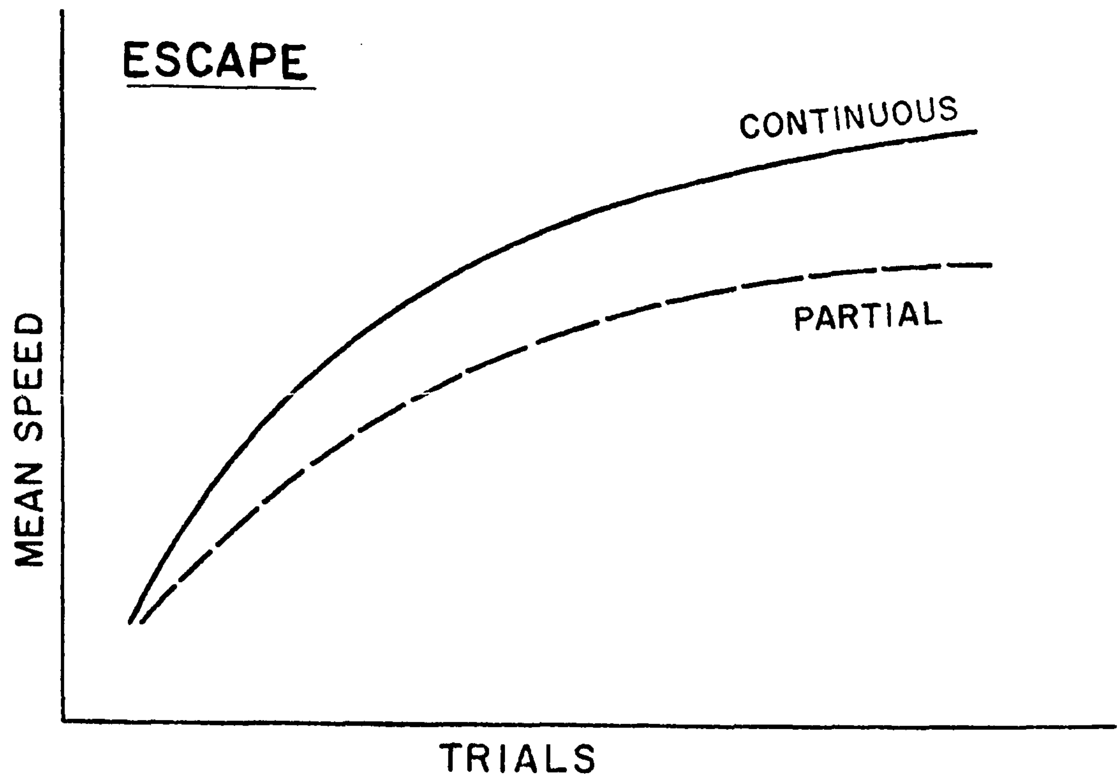
Figure Captions

Figure 1. Idealized acquisition curves of response speed characteristic of partial reinforcement effects in (A) escape and (B) reward conditioning.

Figure 2. Enlightenment effects: Acquisition curves of response speed analogous to those characteristic of partial reinforcement effects in escape (Trouble) and reward (No Trouble) conditioning.


REWARD
PARTIAL
CONTINUOUS
MEAN SPEED
TRIALS

B


ESCAPE
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A

Figure 1

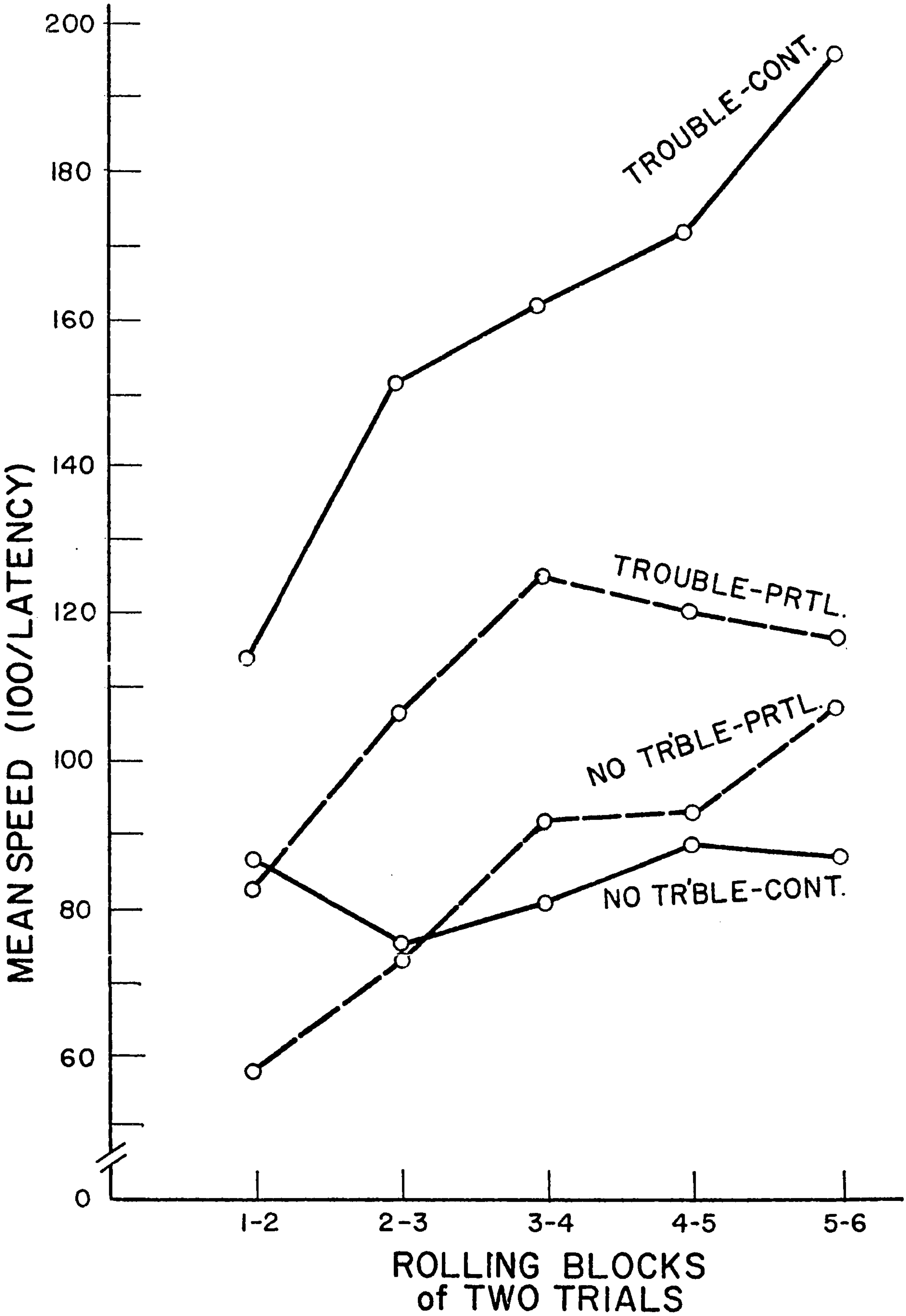
TROUBLE-CONT.
TROUBLE-PRTL.
NO TR'BLE-PRTL.
NO TR'BLE-CONT.
MEAN SPEED (100/LATENCY)
200
180
160
140
120
100
80
60
0
1-2
2-3
3-4
4-5
5-6
ROLLING BLOCKS of TWO TRIALS

Figure 2

APPENDIX A

ALTRUISM--PROPOSAL AND SELECTIVE BACKGROUND REVIEW

Altruism--Proposal and Selective Background Review

An act of helping another which is neither directed at gain for oneself nor compelled in any way defines altruism (see Kreb's review, 1970, p. 259). Studies of human altruistic behavior usually devise a situation wherein a subject has an opportunity to either "help someone to win a prize" or to "turn off electric shock being administered to him." (For experimental control, the person to be helped is the same for all subjects. For instance, what is represented as "another subject seen on closed-circuit TV" is actually an actor seen on video tape, and "another subject here to participate with you in a two-person experiment" is a confederate responding in the same manner to each subject). The laboratory situation is designed to offer neither reward nor compulsion, and helping behavior in this circumstance is operationally defined as "altruistic." That subjects do help in these laboratory situations and thus perform "altruistically" is a fairly consistent finding (Krebs, 1970). Research generating this result has been guided by at least five different explanations of its motivation.

Social Responsibility Norm

Berkowitz and Daniels (1963) proposed that the process of socializing a child produces in him a norm of responsibility to help those dependent on him without expecting a reward. Berkowitz and others (e.g., Berkowitz & Daniels, 1963; 1964; Berkowitz, Klanderman, & Harris, 1964; Berkowitz & Connor, 1966; Goranson & Berkowitz, 1966) have demonstrated that a subject will help a dependent person without a reward for doing it and in some cases without anyone's being aware of the help. For instance, Berkowitz and Daniels (1963) found that subjects who believed that the rating which a "supervisor" would receive depended on how many cardboard boxes they would construct for him produced significantly more boxes than did subjects who thought his rating had no relation to their output. The interpretation that the norm of social responsibility was a factor is supported by the Berkowitz, Klanderman, and Harris (1964) discovery that making clear to subjects that the experimenter would know of their relative output of boxes had no effect on the number the subjects constructed, and by the Berkowitz and Connor (1966) finding that the greater the amount of dependence (20%, 50%, or 80%) of the supervisor for his rating on the subject's productivity, the harder the subject worked.

Factors have been found to lessen the effect, theoretically by lessening the norm's salience. These include a) the person's being dependent through his own choice rather than through circumstances beyond his control (Schopler & Matthews, 1965) b) pressure on the subjects to help (Brehm & Cole, 1966; Goodstadt, 1971) c) cost of helping to the helper either in loss of status (Schopler & Bateson, 1965; Berkowitz, 1970) or in money (Wagner & Wheeler, 1969; Schaps, 1972) d) a "negative" or "selfish" model (a confederate, of course) who denies help to someone in need (e.g., Test & Bryan, 1969; Bryan, 1969; Wagner & Wheeler, 1969) e) the helper's awareness of his poor performance on a task done before he is given an opportunity to help (Berkowitz & Connor, 1966) and f) a confederate's prior denial to the subject of help on a task (Berkowitz & Daniels, 1964; Goranson & Berkowitz, 1966).

Norm of Reciprocity

A possibly stronger norm is that of reciprocity—or giving help in return, which Gouldner (1960) proposed as an evolved, stabilizing factor in most societies. Goranson and Berkowitz (1966) have suggested persons may help dependent strangers as well as those who have given them help because of a "generalized norm of reciprocity" by which one generalizes a help-in-reciprocation response from the helper to those who remind him of the helper. They found (1966) more help in reciprocation than to a standard needy person.

Test and Bryan (1969) found that subjects who received no help themselves but who had witnessed a third party (or model) help a dependent person were later just as helpful as those giving help in reciprocation--evidence against a generalized reciprocity norm, according to the investigators. The effect of merely witnessing the altruism suggested to Test and Bryan that helpers in both situations acted as models of proper behavior in following the norm of social responsibility, (not that of reciprocation).

Greenglass (1969) found that subjects who had previously been harmed gave less help the more similar the dependent person to the person who had harmed them--a "negative generalized norm of reciprocity," but found that prior help elicited more help from subjects than no prior help, regardless of the similarity of the dependent person to the prior helper--evidence for a norm of social responsibility rather than of reciprocity.

Guilt

A number of experiments (Darlington & Macker, 1966; Wallace & Sadalla, 1966; Freedman, Wallington, & Bless, 1967; Carlsmith & Gross, 1969; Regan, Williams, & Sparling, 1972) have yielded indications that altruistic behavior as operationally defined can be motivated by the guilt of having, somehow, caused harm. Darlington and Macker (1966) found that subjects who were told that their poor performance on a task cost their partner loss of experimental credit, later volunteered to give blood to a local hospital significantly more than did controls whose partner was "not eligible for experimental credit," and thus not injured. And Wallace and Sadalla (1966) found that "caught transgressors" (who were led to believe that they had been observed to "break" the experimental apparatus and thus had publicly "ruined" the experiment) volunteered to receive electric shock in a future experiment significantly more than did either "non caught transgressors" (who broke the apparatus but without the experimenter's knowing of their responsibility) or non-transgressing control subjects. The volunteers for the shock experiment "atone through self punishment" said Wallace and Sadalla. Being caught in the transgression is a necessary precondition to guilt motivated self punishment, by which one tries to reduce or prevent externally imposed punishment, which public awareness of a transgression makes more likely.

Subjects induced to lie about receiving a pre-experimental "tip off" from a confederate about the nature of an upcoming experiment (less obvious fault), and subjects who knocked over a pile of index cards belonging to a graduate student (obvious fault) were both more willing to volunteer for a future experiment for that graduate than were non transgressors, but only when assured that the harmed graduate student would not be encountered (Freedman, Wallington, & Bless, 1967).

To distinguish between a possible confounding of altruism and a mere compliance to a direct request for help, Regan, Williams, and Sparling (1972) devised a field experiment which permitted subjects voluntarily to expiate guilt. They found that subjects on their own inspiration (without request) informed a confederate that she had lost some candy from a broken grocery bag more when convinced they had broken someone else's camera more than when not so convinced. To see if personal responsibility is necessary for guilt arousal or if mere witnessing of harm is sufficient, Rawlings (1968) had subjects first see a confederate either shocked after every wrong estimate they made or shocked on a random schedule unrelated to their own performance on an estimating task. Then she measured the amount of shock the subject would assume in sharing a given duration of shock with a completely different partner in another guessing task. Both the "guilty" subjects and the "witnesses to pain" took significantly more shock than did two control groups who on the first task either saw no shock given or got shock along with the other person. Rawlings felt that the "Reactive Guilt" of knowing one has harmed another is the guilt most usually studied and is to be distinguished from the "anticipatory guilt" of the witness of a victim's harm: the guilt of violating--by failure to come to the aid of the victim--the familiar social responsibility norm.

Regan (1971) found a difference in subjects guilty of harming and guilty as witnesses when half of each group got the chance to "talk out" and rationalize their guilt during an interview prior to a request for charity. The directly guilty who were thus catharted, donated less to a charitable fund than did their uninterviewed counterparts. The interviewed half of the guilty-as-witness group gave as much as the noninterviewed member of their group. Regan (1971) supposed that guilt-as-witness was actually a concern with injustice. The witnesses were compelled to act charitably to reconfirm a belief in a "just world."

Perceived Injustice

The basic assumption of this approach to altruism is this need to believe in a just world where people get what they deserve. Any perception of someone's suffering innocently constitutes a "perceived injustice" and threatens that belief. The observer can "reestablish justice" by compensating the victim for his suffering or by persuading himself that the victim deserved his fate by, for instance, derogating him. The similarity to Dissonance theory (Festinger, 1957) is obvious.

As an example of derogation and compensation both, Lerner and Simmons (1966) found that subjects who observed a female confederate get electric shock for each incorrect response in a task and were then given the chance to compensate the confederate for her suffering, later rated her positively. Subjects unable to compensate her derogated her. Subjects who believed she was to undergo still more shock derogated her more strongly and subjects who had been told that she had volunteered to be shocked so that they (the subjects) could get credit for being in an experiment soundly derogated her. In a follow-up to this experiment Lerner (1971) found subjects again negatively rating a volunteer "martyr"--even those that weren't beneficiaries of the martyrdom (and therefore liable to guilt). They did not devalue a confederate who only acted like she was getting shocked or who was given money for "suffering, no injustice inhering in either situation.

Simmons and Lerner (1968) studied a supervisor-worker situation like that described above (e.g., Berkowitz & Daniels, 1963) and found that subjects made more envelopes for a partner who, like them, had been denied help than for a partner that had been helped by those he had supervised. Controls who had not been denied help themselves did not favor those previously denied help. The Berkowitz-Daniels (1964) effect (one's being denied help will decrease his tendency to help someone else) is thus qualified: a betrayed-like-me label on the other person may increase helping.

Empathy

Aronfreed (1968, 1970) pointed out that although a person performs an altruistic act in the absence of external reward, the behavior will not necessarily be maintained without any reinforcing consequences. Specifically, Aronfreed (1968, 1970) proposed that altruistic behavior is reinforced by the help giver's getting either increases in positive emotion or decreases in negative emotion by empathy i.e., vicariously. Aronfreed explains the socialization of altruistic behavior in a paradigm for the acquisition and subsequent testing of a secondary reinforcer (e.g., Miller, 1951). A stimulus originally neutral to a child, for instance cues of happiness (smiles, etc.) at the fortunate outcomes of an adult occur together with a stimulus of naturally reinforcing quality like an embrace. Even as Pavlov's bell, repeatedly rung before mouth-watering food is presented to a dog, eventually acquires the capacity to elicit salivation by itself, the smiles and other cues acquire a positive, "secondarily reinforcing effect" from repeated occurrence with natural emotional reinforcers like being hugged. This can be tested experimentally in a second phase of a conditioning study by using the stimulus (a smile) as the reward of making a to-be-learned instrumental response (like pressing a lever). If the subject learns a response the only reinforcement of which is the presentation of the once neutral stimulus of the smile, its acquired (secondary) power to reinforce is demonstrated.

In a child's own socialization process the originally neutral (i.e., to the neonate) cues of emotional change (smiles, frown) in another person frequently occur together with changes (positive or negative) in his own emotion. Thus cues of the happiness or misery of the parent (and by generalization, of another person) can arouse emotion in the child--the child has developed a capacity for empathy or "feeling with" another. The child can then learn altruistic acts the sufficient reinforcement for which is "feeling with" the beneficiary his increase of happiness (or relief from misery) as a result of the help. As the child's ability to imagine the future effects of present behavior develops, his altruistic behavior can be maintained solely by the anticipation of its future consequences for a beneficiary. Aronfreed and Paskal (Aronfreed, 1968, 1970) demonstrated the learning of altruistic behavior in girls from six to eight years old in two conditioning-like phases. In the first, "basic socialization," phase, the child saw a woman work a "choice box" with two levers, one of which delivered candy and the other a red light six out of ten times it was pushed. At the illumination of the red light the woman would smile and exclaim excitedly "Oh, there's the light!" and firmly hug the child. In the second, testing, phase, the child operated the levers herself, and the confederate both smiled and exclaimed (i.e., gave "conditioned cues") as before but did not hug the child (i.e., did not give "primary reinforcement") whenever the child would choose the red light. The dependent variable was the number of trials on which each child behaved "altruistically" by sacrificing candy to choose the light which had made the woman happy. The children actually chose the lever which produced the expressive cues of the adult more frequently than they chose the candy-producing lever. Control subjects did not. They had got only the smile and exclamation in the first phase--or only the hug. That is, for the child to choose the red light the expressive (relatively neutral) cues and the naturally reinforcing hug had to occur together in the training phase. This argues for conditioning-like learning. Midlarsky and Bryan (1967), replicating the experiment, equated the children in the experimental and control groups for the number of candies they possessed at the end of the training phase. The children were all given the opportunity to make an anonymous donation of candy to a fictitious "needy child," a situation in which subjects could only "cognitively anticipate" the needy child's reactions to the receipt of candy, since the needy child was not present (Aronfreed, 1968). The children to whom both expressive cues (smile, etc.) and physical affection had been presented were the most "altruistic," apparently having internalized the norm of self sacrifice during the lever pressing session so that it was available for expression in the "charity" session.

Aronfreed (1968, 1970) then demonstrated the role of a model in teaching altruistic behavior to seven and eight-year-old girls. For the basic socialization condition, the child subject watched a woman confederate react in distress to a loud buzz in her earphones on six "wrong" trials out of twelve total in a "toy classification" task. The subject got a demonstration of the loud noise in her own earphones _after_ the adult did. In the second phase of the experiment, the child, watching the adult, learned that a lever would turn off the earphone noise whenever it occurred. The third phase was the test: the subject, now without earphones, saw another child (a confederate) wince in distress at the apparent earphone noise which she herself did not hear. The dependent variable was the number of trials on which the subject pressed the lever to reduce the other child's distress. For control groups some element in the conditioning process was missing in the first phase. For instance in one group the adult's distress (CS) wasn't paired with the subject's own distress (UCS); in another the adult confederate wore earphones but did not emit distress cues (CS), etc. These controls showed significantly less altruistic behavior than the subjects getting the experimental treatment.

Altruism as a Reinforcer

Using an "extension of liberalized S-R theory" (Miller, 1959) Weiss and associates (Weiss, Buchanan, Altstatt, & Lombardo, 1971; Weiss, Boyer, Lombardo, & Stich, 1973: Stich, 1973) found a novel implication in the studies cited above. Weiss reasoned that if guilt (or inequity or empathy, etc.) motivates like a drive, then it should function consistently like drive in a standard conditioning situation, producing equivalents of classical learning effects like drive magnitude, with the same dependent variable, speed. One should also find corresponding altruistic reinforcers which generate effects like, for instance, delay of reinforcement.

Weiss et al. (1971) constructed a social analogue to the standard instrumental escape conditioning experiment (where, if an organism makes an "instrumental response,"--such as pushing a lever upon the presentation of a cue or "conditioned stimulus,"--the ongoing noxious stimulus of continuous loud noise or electric shock is turned off briefly). This brief cessation is the response's reward. The pattern of drive arousal through shock, the presentation of the cue, the subject's response, and the subsequent reinforcement constitutes a trial, which is repeated several times in a series. If the drive arousal and reinforcement have been successful, the dependent variable, speed (the reciprocal of the time-lapse from cue presentation to response), should increase over the series of trials.

Weiss et al. (1971) used a social stimulus: the simulated suffering of another human being was the noxious stimulus, which was interrupted by pushing a button upon the cue of a signal light. The social reward was the cessation of the other person's suffering. A confederate had a "shock device" which "delivered shock" attached to his forearm and plugged into a wall while he performed a steadiness task under that stress. He winced in pain while trying to hold a metal stylus steady in a tunnel.

Meanwhile the subject worked at evaluating his performance according to three criteria. Both the conditioned stimulus and the instrumental response were concealed within this "evaluation task." At an "evaluation signal light," the subject set three dials to indicate his evaluation of the confederate's performance according to the three criteria. These evaluations were essentially distractors from the critical instrumental response: to push a button which would "record the evaluation settings on the dials." Immediately after that button was pushed the shock went off, and the confederate breathed a sigh of relief as he received a 10-second break from his stressful task--the only reward to the subject watching him for the subject's pushing the button. The lapse of time from the cue light's turning on to the instrumental response (when converted to its reciprocal, speed) was the dependent variable. With the same speed variable used in learning experiments upon which it was modelled, Weiss et al. (1971), found this altruistic reward to produce the same effects as escape conditioning with conventional (non-social) rewards like the cessation of shock to oneself. For both continuous reward (turn-off of shock to the other person after each button push following the cue) and for partial reward (turn-off of shock after 50% of the button pushes), the speed of the response increased over the course of trials and approached a leveling off (asymptote) for both percentages of reinforcement, with the speed of the continuous group exceeding that of the partial group at every trial. Thus the opportunity to help another, whatever the motivation, was reinforcing. The partial-continuous pattern of curves, moreover, demonstrates that it was reinforcing like one's own escape from shock. That is, the curves' patterns resembled those generated by rats learning a lever-press response to escape shock to their paws rather than curves produced by hungry rats whose lever pressing brings a measured amount of food each time. (When food is a reward, the partially reinforced group's speed eventually exceeds that of the continuous group).

Weiss, Boyer, Lombardo, and Stich (1973) report another set of experiments with the same apparatus and circumstances, that demonstrated three things: a) that subjects reinforced by terminating shock to the other person were significantly faster after 15 trials than a control group getting "shock" but no reinforcement (to be distinguished from the no shock-no reinforcement controls of the earlier--Weiss et al., 1971--experiment) B) that subjects getting three different magnitudes of reinforcement showed, at the end of training, speeds that took the same rank order as their respective reinforcement magnitudes: high magnitude exceeding medium magnitude exceeding zero magnitude of reinforcement. (Reinforcement was the amount of shock reduction from a painful level--either termination of all shock (high magnitude or reduction from painful to a merely uncomfortable level medium magnitude or no reduction al all zero magnitude) c) that the intermittent "shock" to a human of observing another person's suffering works the same way as intermittent electric shock to an organism itself. In the classic intermittent shock paradigm, the speed of an organism increases exactly with an increase in the per cent of trials on which the organism is shocked before its pressing a lever terminates the shock. (On the other trials the shock is never turned on at all, though the organism, having been shocked on other trials, presses the lever at the cue to escape anyway, e.g., Franchina, 1966, 1969). Weiss et al. (1973) administered the "shock" of witnessing another person's suffering on 100% and on 33% of the trials. (On shock-free trials a sign saying "Shock Off" lighted up and there was no evidence of suffering by the confederate). Weiss et al. found that the termination of this social "shock" of another person's suffering produced the intermittent shock effect: the 100% "shock" group responding faster than the 33% group who in turn were faster than subjects getting no shock termination at all after the button push response.

Stich (1973) examined the Weiss et al. (1971; 1973) situation for a possible non-altruistic source of reinforcement for the button push response: possibly the reinforcement lay not in helping the other person but in removing from oneself the disturbing and obnoxious sight of suffering. Stich allowed a group of subjects to "leave the scene" of suffering as reinforcement of the response by having a masonite shutter cover the window through which the subjects in these experiments watched the other person. They were told that behind the shutter, the person continued to be shocked--suffering but "out of sight." Stich found that shutting out the sight of suffering increased the speed of the response it followed significantly, but that helping by turning off the shock as in the earlier Weiss et al. experiments (1971; 1973) increased it significantly more. Stich rejected an interpretation of his two experimental groups as a sort of magnitude of leaving the scene, where actually ending the shock would only constitute a more complete departure ("not only out of sight but out of mind"). He felt that evidence from other altruism studies like those cited above and from observation of his subjects' obvious concern for the shocked confederate (as reported by several of his experimenters) argued for an element of genuine altruism--helping unselfishly. His results did raise a question about the definition of altruism as an act which conveys no rewards for the helper other than the relief of the helped person, since in part the helpers may act to "shut off that annoying suffering."

Positive Altruism--A Proposal

Weiss (Weiss et al., 1973) raises the question whether altruistic drives are always aversive--as both the results of his own research (Weiss et al., 1971; 1973) and the guilt-motive theory (e.g., Rawlings, 1970) suggest, or whether thay can also be appetitive (like hunger and thirst), as the innate altruism theory of Campbell (1965) would indicate. Weiss suggests that "the rather homeostatic concepts of inequity and its restoration" are consistent with an appetitive drive interpretation (Weiss et al., 1973, p. 398). If it is possible for one to "hunger and thirst after justice," positive reinforcement would be provided by the satisfied goal responses of helping to restore equity.

This experiment is designed to examine the appetitive drive possibility by extending the liberalized S-R theory's (Miller, 1959) application to altruism further with a social analogue to instrumental reward conditioning. Weiss (Weiss et al., 1973, p. 398) noted that partial reinforcement will distinguish appetitive from aversive drives (reward conditioning from escape conditioning) since reinforcement less than 100% of the time increases asymptotic response speed in reward conditioning (e.g., Amsel, 1958; Spence, 1960) but retards speed in escape conditioning (Bower, 1960). He also noted that drive magnitude combine additively in reward conditioning (e.g., Weiss, 1960; Black, 1965) so that increasing magnitude of reinforcement brings a linear increase in response speed for a given level of drive--a higher level of drive producing a higher curve, parallel to that produced a lower drive (i.e., with speeds that exceed those at lower drive by a fixed amount at each level of reinforcement magnitude. However, the two magnitudes interact in escape conditioning (e.g., Campbell & Kraeling, 1953; Campbell, 1968) so that the linear curves at two levels of drive are not parallel but divergent; i.e., as magnitude of reinforcement increases, the gap between them widens.

The proposed experiment will employ a 2 x 3 x 2 x 6 repeated measures design to investigate a situation in which the other person, rather than palpably suffering, is in an information-deficient status compared to the subject. The subject, by making a response, gets a chance to equalize the unevenly-distributed resource: information. Since shock to another person has effects analogous to those produced by shock to oneself (Weiss, 1971; 1973), another's relative deprivation (especially of an easily-shared and irreducible resource like information) may produce reward conditioning effects. This experiment is based on that hypothesis.

Suppose the other person is engaged in a navigation task, the aim of which is to steer toward a given point which is visible to him as a light (as if steering at night). He has no way to tell--other than the "feel of the wheel"--whether he is on course or is off course due to the complicating factors of wind, wave and current which his "navigation simulator" has been programmed to change with each new steering problem.

The subject, in another room, monitors the other person's performance via a radio signal (which he alone hears) which tells him if the other person is on course or is drifting off course to the left or to the right on each of a series of navigation problems. During each navigation problem the subject gets (at a cue light) the chance to open a line of communication to the other person (by the familiar button push) to advise the other person. The chance to advise the other person is proposed as a positive reinforcer and each navigation problem as an analogue to an instrumental reward conditioning trial which includes drive arousal (through awareness that one has information that the other person could use, a cue (the signal light), an opportunity to respond (by pushing the button) and reinforcement (advising the other person about his position).

Although, intuitively, the proposed experimental situation seems analogous to instrumental reward conditioning, the partial versus continuous reinforcement effects, and the drive magnitude-reinforcement magnitude interaction effects are the test. Therefore, analogues of partial and continuous reinforcement schedules, of drive magnitude, and of reinforcement magnitude are proposed.

A drive magnitude analogue will be the need of the other person for advice. If the other person is managing to navigate on course (even though unaware that he is) the subject would find a limited measure of altruistic reinforcement in advising him—the other person's relief at hearing that he is, in fact, on course. But if he is going off course in a given direction, that information should be more useful and welcome, and therefore more altruistically reinforcing. In the proposed experiment the other person will be either on course or off course when the cue lights up.

A magnitude of reinforcement analogue will be the amount of feedback given to the subject once he delivers his advice: a) the subject simply states his advice and gets no feedback and, therefore, no knowledge if the other person actually receives it (which is plausible since the two communicate by radio: it will be explained that at times the program simulates a radio receiver's being temporarily out of order.) b) the subject states the advice and hears the other person (through headphones he wears) give a simple acknowledgement like "roger." c) the subject states the advice, receives acknowledgement, and continues to monitor the other person's performance as before (hearing the subject continue on course or return to course).

Dictionary of Analogies

Using a learning theory paradigm as a model requires a summary of the analogies drawn between the variables of the learning model and the variables of the proposed research study in a "dictionary of analogies" (Weiss, 1968).

Corresponding to drive arousal is the subject's getting priviledged information which the other person could use.

Corresponding to the instrumental response is the button-push response (at a cue) which "opens the communication line to the other person."

Corresponding to reinforcement is the opportunity to advise with a given level of feedback following the advice.

Corresponding to an increasing magnitude of drive arousal (as in 8 or 12 hours of food deprivation, respectively) are the subject-on-course and the subject-off-course conditions.

Corresponding to an increasing magnitude of reinforcement (as in delivery of one, or two, or three pellets of food to a hungry organism after each instrumental response) is a) the opportunity to advise only, or followed by b) acknowledgement of the advice or by c) both personal acknowledgement and continued monitoring of the other person's performance.

Corresponding to a reinforced trial in instrumental reward conditioning is the sequence of the analogues of drive, cue, response and reinforcement just defined.

Corresponding to a nonreinforced trial in instrumental reward conditioning is the same sequence with the reinforcement omitted.

Corresponding to partial reinforcement is a mixture of trials in which the subject's response sometimes is followed by the opportunity to advise and sometimes is not.

Corresponding to the dependent variable of response speed is the subject's speed in pushing the button to open the line of communication (the reciprocal of the time lapse from the signal light cue to the button-push response).

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APPENDIX B

INSTRUCTIONS FOR DEMONSTRATION OF THE SIMULATOR USED TO AID IN THE DECEPTION OF THE ACTUAL SUBJECT

INSTRUCTIONS FOR DEMONSTRATION OF THE SIMULATOR

USED TO AID IN THE DECEPTION OF THE ACTUAL SUBJECT

EXPERIMENTER: SEAT THE SUBJECT AT THE SIMULATOR	This is one of several types of maneuvering simulators--this is the one you will be working on later. It's not identical to the one which the other person in this experiment will be using, but the basic principles are the same. Now, just look through the window. . .
TURN SIMULATOR ON AND OPERATE	Now, I'm making a slow turn to the right; and you can see the colored lights appear. These represent buoys or beacons as seen from the window of a moving vessel. The trick in steering toward one of them is to turn the right way, and then to stop the turn and get lined up.
LINE UP ON ONE OF THE LIGHTS	You will hear the other subject get instructions to locate and "head for" a particular light, which he will do by operating the controls much as I'm doing here. The main difference is that <u>this</u> simulator is designed to measure quickness and adeptness at operating the controls, whereas the other measures accuracy and precision. On this one, we measure how quickly the subject can get lined up on a light. On the other one, it's how <u>accurately</u> they steer toward the light.
TURN OFF SIMULATOR	
ESCORT THE SUBJECT TO ROOM L	Now please follow me to Room L.

GENERAL INSTRUCTIONS FOR ALL CONDITIONS

TO THE ACTUAL SUBJECT "L" AND TO THE "OTHER SUBJECT," "K"

["ZOT" is a signal to the experimenter at the controls to work signals not triggered automatically in sequence.]

You are now in the two person phase of your experiments. In this study, we're interested in the effects of monitoring and feedback on performance on the two maneuvering simulators. We are gathering data on three kinds of perception: audio, visual and tactile.

For this phase of the experiment, to preserve anonymity, you will not be addressed by your names, but according to the room in which you are seated. So you will be called Subject K and Subject L, since you are in rooms K and L, as you can see by looking at the sign on the wall in front of you.

Subject K, you are seated at the simulator on which you'll be working in this part of the study. This simulator is designed to produce the types of conditions encountered in steering a large boat or ship--which are quite different from those when steering a car, motorcycle, or other land vehicle. One of the differences is that a ship's pilot, in a channel or harbor at night, has to steer by means of lighted beacons or buoys. Thus, through the windshields of the simulators, about all you can see will be various lights.

Subject K, you will get commands, over the intercom, to steer toward a given buoy, that is, toward a distinctive light. Subject L, while K is maneuvering, you will hear audio signals--distinctive sounds--which will show how accurately K is performing. And from time to time you may have a chance to advise K on how he's doing. Now L, you are the only one who can hear these sounds, which are important feedback signals about Subject K's performance. Subject K, you will not hear these signals. All you will hear will be my voice—and L's, should he advise you.

Each of you has a diagram on the wall to the left. Please look at it. Subject K, to steer correctly on your simulator, you have to combine two elements: timing and control. You must start your turn right on the command of "Go!" Too early or too late, and you'll wind up off course. And you must also control the wheel without the aid of any instruments which help indicate your position. But you should be able to feel whether you are understeering or oversteering--swinging wide or coming around too quickly. If you let the wheel drift, or if you yank it around too hard, you'll again wind up off course. As you both can see from the diagram at left, these two factors, timing and control, allow nine possible turn patterns--only one of which leaves you on course. So, Subject K, you have to be alert for the commands, and you will also have to acquire what's called "the feel of the wheel," since as we said you will be piloting without instruments--"by the seat of your pants," so to speak.

Subject L, your diagram includes a description of the K-simulator feedback signals. When Subject K is on course--that is, making the turn properly--you'll hear a steady tone in your headset. If K goes off to the left of the proper heading, you'll hear a fast, high-pitched beeping. If K goes off to the right, you'll hear a slower, low pitched sound, not unlike a foghorn. So, as the diagram indicates, the steady tone means "On Course"; the high, fast sound means "Off to the Left"; the low, slow tone means "Off to the Right." Remember, these signals indicate K's path in relation to the course he should be taking. This course is computed for the wind and current direction and velocity, and wave factors. In other words, these are complications that are added into the simulator pattern. Now that's the <u>mechanical</u> feedback part of this phase. But as I said earlier, L may have chances to advise K on how he's doing--another kind of feedback. Here's how that will work:

ZOT: LISTEN SIGNAL

If you'll both look at your console, you'll see the "Listen" signal is on. Whenever this comes on, I'll give K a command for a maneuver. As K starts the maneuver, L will begin to hear the audio feedback. L, you'll listen; and most obviously you will note whether K is on course, off course to the right or off course to the left. You may be able to determine something else from the signals. For instance, whether K is off course from the very start of the turn or whether he starts on course and then goes off, and so on.

ZOT: ADVISE SIGNAL

Now, Subject L, from time to time you'll see this "Advise" signal. This signal means you may have a chance to talk to K, to advise on how he's doing. To take this opportunity, you must throw the "Advise" switch which is located directly below the signal. Now, please throw it for practice. . . . All right. Now, L, in order to talk, you must press your "Start" button, which is below the signal which is now lighted. You can go ahead and press it. . . . Now when you get the second signal--the "Talk" signal, that's the time when you can advise K, tell him he's on course or off, and in which direction. When you've finished talking, you press the "Finish" button, which you can press now for practice. . . All right.

So, those are your intercom controls, L: your "Listen" signal, your "Advise" switch, and the "Start" and "Finish" buttons. You can ignore other lights which happen to be on the panel. Now, Subject K, as we were going through this, you also saw your <u>own</u> "Listen" signal come on. This will come on whenever either Subject L or I talk to you. You also saw the "Acknowledge" signal, which I will show you again, right now. When this signal comes on, Subject K, you simply acknowledge that you <u>did</u> hear the message. You can acknowledge fairly briefly because you are going to be busy with the steering. So just to say that you got the message, or that you heard the information will be enough.

All right, L and K, that's the general pattern. The timing and occurrence of events may be quite irregular as we go along: how long each maneuver lasts, whether or not L gets a chance to speak each time, whether K gets a chance to acknowledge or not, whether the audio feedback is on continuously or intermittently, and so on. So, you'll both just have to watch the signals and listen for what comes. The exact sequence for each maneuver is calculated as we go along. If there do appear to be gaps in the cycle they are deliberate and not due to equipment malfunction. Also, Subject L, along with the signals you may hear me read some data into the record for this phase. This you can just ignore.

Now I will. . .ummm. . .well, <u>one</u> of us will be in, in a minute, to make sure that Subject K understands the simulator controls, and at the same time, we'll play a sample of the audio feedback signals for L.

<u>DEMONSTRATION OF SIGNALS</u>

To Subject L (actual subject) only

Okay, L, here are the feedback signals. First of all the "On Course" signal. . . .(demonstration for 5 seconds). Here's "Off Course to the Left". . . .(demonstration for 5 seconds). And this is "Off Course to the Right". . . .(demonstration for 5 seconds). Now, Subject L, let me go through the signals once again, rather quickly:

ZOT: LISTEN SIGNAL

This is your "Listen" signal.

ZOT: ADVISE SIGNAL

And this is the "Advise" signal. Now please throw the "Advise" switch. Now you see the signal which says in order to talk you have to press the start button. Now, when you do not see this signal it means that the intercom is dead. K will <u>not</u> be able to hear your advice, so don't say anything. If however, you <u>do</u> see the signal, feel free to go ahead with your advice. Now you can press your "Start" and "Finish" buttons and in a moment someone will "come on" over the intercom to answer any questions you may have.

APPENDIX C

SCRIPT OF THE SIX CASSETTE TAPE RECORDINGS FOR THE SIX TRIALS

SCRIPT OF THE SIX CASSETTE TAPE RECORDINGS* FOR THE SIX TRIALS

The sequence includes:

A) The exchange between the "Experimenter" and the "Other Subject": Command and Response.

B) The initial electronic signals
For Trouble: the steady tone lapsed into the Off Course signal indicated for each trial.
For No Trouble: the steady tone signalled On Course throughout.

C) The "Experimenter's" voice-over the signals (the final words cueing the CS signal).

* * * (Interruption of the Cassette--the CS signal and the subject's advice)

D) The "Other Subject's" acknowledgement of the advice.

E) Electronic Signals
For Trouble: Off Course moving to Back On Course.
For No Trouble: continuing On Course.

F) The "Experimenter's" voice-over the final electronic signals.

TRIAL I

A) Experimenter: Now find and head for the quick flashing red light buoy.

Other Subject: All Right

B) Signals: On Course to Off Left (Trouble)
On Course (No Trouble)

C) Experimenter: Starboard turn, 25 degrees, drift plus 3, red pattern, counter on 27.

* * *

D) Other Subject: I got the message.

E) Signals: Off Left to On Course (Trouble)
On Course (No Trouble)

F) Experimenter: Red pattern, counter now on 27.

---

*There were actually 24 cassettes taped: six each for Trouble and No Trouble conditions, and with both a male and a female voice.

TRIAL II

A) Experimenter: Now find and head for the steady beam white light buoy.

Other Subject: Okay.

B) Signals: On Course to Off Right (Trouble)
On Course (No Trouble)

C) Experimenter: Port turn, 30 degrees, drift is minus 2, still on red. Check drift at minus 2.

* * *

D) Other Subject: I got the information.

E) Signals: Off Right to On Course (Trouble)
On Course (No Trouble)

F) Experimenter: Still on red, repeat minus 2.

TRIAL III

A) Experimenter: Now try the slow flashing green light buoy.

Other Subject: Okay.

B) Signals: Off Right to On Course to Off Left (Trouble)
On Course (No Trouble)

C) Experimenter: Turning starboard 25 degrees, drift zero, counter now 38, and we are on. . .green.

* * *

D) Other Subject: I heard the message.

E) Signals: Off Left to On Course (Trouble)
On Course (No Trouble)

F) Experimenter: Counter still 38, on a Green.

TRIAL IV

A) Find and head for the quick flashing green light. Repeat, quick-flashing green light.

Other Subject: Okay, the quick flashing green light. . . .

B) Signals: On Course to Off Right to On Course to Off Left (Trouble)
On Course (No Trouble)

C) Experimenter: Port 35 degrees, drift minus 3, continue green 33.

* * *

D) Other Subject: I got the message.

E) Signals: Off Left to On Course (Trouble)
On Course (No Trouble)

F) Experimenter: Continue green . . .43.

TRIAL V

A) Experimenter: Find and head for the steady beam green light buoy.

Other Subject: Uh, would you repeat that please?

Experimenter: (repeats)

Other Subject: Okay.

B) Signals: Off Right (Trouble)
On Course (No Trouble)

C) Experimenter: Twenty degrees starboard, drift of plus 1, that's plus one, and we are now on blue.

* * *

D) Other Subject: I got the message.

E) Signals: Off Right to On Course (Trouble)
On Course (No Trouble)

F) Experimenter: That's plus 1, on blue.

TRIAL VI

A) Experimenter: Now aim for the quick flashing red light buoy.

Other Subject: (no answer)

B) Signals: On Course to Off Right (Trouble)
On Course (No Trouble)

C) Experimenter: Port turn 25 degrees, drift minus 2, blue. Counter 48. That is. . .(fades)

* * *

D) Other Subject: I got the message.

E) Signals: Off Right to On Course (Trouble)
On Course (No Trouble)

F) Experimenter: Blue, counter 48. Going to yellow.

APPENDIX D

MEAN SPEEDS FOR ACQUISITION TRIALS

TABLE I

MEAN SPEEDS FOR ACQUISITION TRIALS

Trial	Full Feedback		Acknowledgement		None	
	Cont.	Prtl.	Cont.	Prtl.	Cont.	Prtl.
TROUBLE GROUPS						
1	.928	.679	.829	.836	.984	.987
2	1.113	.855	1.443	.819	1.066	1.058
3	1.191	1.012	1.584	1.266	1.417	1.281
4	1.020	1.008	1.634	1.225	1.248	1.209
5	1.285	1.054	1.784	1.168	1.217	1.295
6	1.417	1.173	2.124	1.153	1.246	1.405
NO TROUBLE GROUPS						
1	.331	.533	.956	.553	.668	.532
2	.493	.739	.765	.610	.771	.631
3	.612	.689	.718	.813	.695	.557
4	.778	.688	.883	.992	.884	.676
5	.766	.761	.891	.883	.912	.809
6	.891	.747	.837	1.253	.606	.744

APPENDIX E

SUMMARY TABLE

TABLE II

SUMMARY TABLE FOR 2 (TROUBLE) x 3 (FEEDBACK) x 2 (SCHEDULE) x 6 (TRIALS) ANALYSIS OF VARIANCE ON ACQUISITION SPEEDS

Source	MS	df	F
Total	.406	863	
Between	1.546	143	
A (Trouble)	44.998	1	37.62***
B (Feedback)	3.673	2	3.07*
C (Schedule)	2.904	1	2.43
AB	0.176	2	.15
AC	2.570	1	2.15
BC	.807	2	.67
ABC	1.697	2	1.42
Error	1.196	132	
Within	.179	720	
D (Trials)	3.028	5	19.92***
AD	.562	5	3.70**
BD	.209	10	1.37
CD	.028	5	.19
ABD	.154	10	1.01
ACD	.296	5	1.94
BCD	.149	10	.98
ABCD	.421	10	2.77**
Error	.152	660	

*$p < .05$ **$p < .01$ ***$p < .001$

APPENDIX F

CRITICAL AND OBTAINED VALUES OF INDIVIDUAL COMPARISONS

TABLE III

CRITICAL AND OBTAINED VALUES OF INDIVIDUAL COMPARISONS
(in order cited in the text)

Individual Comparisons between Trouble Groups by Schedule Means	
Trouble Continuous *versus* No Trouble Continuous	q critical $_{.01}$ = 4.50; q observed = 7.60; $p < .01$
Trouble Partial *versus* No Trouble Partial	q critical $_{.01}$ = 4.50; q observed = 4.67; $p < .01$

Individual Comparisons between Cells at Trial 6	
Trouble-Acknowledgement Continuous *versus* No Trouble-Acknowledgement Continuous	q critical $_{.01}$ = 5.39; q observed = 7.38; $p < .01$
Trouble-Acknowledgement Partial *versus* No Trouble-Acknowledgement Partial	q critical $_{.05}$ = 4.65; q observed = .5716; $p > .05$ [Nonsignificant]

TABLE III—Continued

Individual Comparisons between Feedback Means	
Acknowledgement Feedback versus Full Feedback	q critical $_{.05} = 3.36$; q observed $= 3.49$; $p < .05$
Acknowledgement Feedback versus None	q critical $_{.05} = 3.36$; q observed $= 2.04$; $p > .05$ [Nonsignificant]

Individual Comparisons between Trials by Cell Means Trial 1 versus Trial 6	
TAC:	q critical $_{.01} = 5.30$; q observed $= 11.44$; $p < .01$
No TAP:	q critical $_{.01} = 5.30$; q observed $= 6.186$; $p < .01$
No TFC:	q critical $_{.05} = 4.56$; q observed $= 4.60$; $p < .05$

APPENDIX G

INDIVIDUAL SCORES--RAW DATA

TABLE IV

INDIVIDUAL SCORES—RAW DATA

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
Trouble-None-Continuous												
1	.694	.422	2.273	.457	1.177	.990	.459	1.282	1.923	.543	.990	.595
2	.677	.578	2.000	.465	1.333	1.163	.538	1.299	1.110	.787	1.333	1.515
3	2.778	.541	1.333	1.235	1.064	1.205	1.220	1.409	1.887	.781	1.471	2.083
4	1.587	.625	1.333	.690	1.563	1.031	.855	1.191	2.381	.690	1.563	1.471
5	1.449	1.020	2.222	.840	1.695	1.110	1.075	1.409	1.923	.272	.885	.699
6	3.333	1.087	2.326	.813	.877	.962	.893	1.206	1.111	.741	.893	.704
Trouble-None-Partial												
1	.840	.901	.402	1.539	.741	.714	.535	1.282	2.326	.617	.962	.980
2	.885	.474	1.220	1.887	1.031	1.124	.340	1.299	.901	.885	1.010	1.639
3	1.149	.613	2.128	1.042	1.110	1.205	.459	1.266	2.000	.617	1.961	1.818
4	1.923	1.136	1.961	.606	.663	.935	.571	1.191	1.587	.813	1.370	1.786
5	.694	.690	2.222	1.333	.901	1.351	.400	1.786	2.128	1.031	1.266	1.734
6	.826	1.020	2.273	1.493	.893	1.587	.680	1.389	2.778	.633	1.471	1.818

TABLE IV--Continued

No Trouble-None-Continuous

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
1	.273	.403	1.053	.348	.752	.330	.893	.685	.813	.617	.552	1.299
2	.198	.943	.641	1.250	.758	.395	1.333	.565	1.250	.368	.935	.613
3	.078	.847	.725	.990	1.136	.304	.255	.463	1.754	.578	.535	.676
4	.431	.870	1.250	1.111	1.177	.392	1.124	.463	1.299	.256	1.149	1.087
5	.704	.901	.588	.800	1.539	.424	1.493	.637	1.515	.388	1.124	.826
6	.350	1.177	.431	.508	1.064	.415	.109	.746	.917	.840	.412	.306

No Trouble-None-Partial

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
1	.971	.465	0	.331	.375	.350	.546	1.333	.452	.465	.617	.478
2	1.111	.662	.467	.091	.218	.344	.690	1.333	1.087	0	.885	.629
3	.870	1.389	.488	.230	.304	.249	.667	.556	.658	0	.617	.654
4	.781	1.786	.662	.226	.474	.372	.730	.833	.781	0	.813	.654
5	1.471	1.064	.741	.279	.602	.524	.917	.943	1.020	.397	1.031	.714
6	1.539	1.053	.980	.189	.685	.513	.617	1.136	.971	0	.633	.613

TABLE IV—Continued

Trouble-Acknowledgement-Continuous

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
1	.565	.730	2.128	1.250	.699	0	.592	.629	.826	.625	.495	1.409
2	.847	1.220	2.941	1.587	1.887	2.381	1.613	.917	1.613	.465	.599	1.250
3	.962	.901	2.500	2.857	2.273	2.778	1.539	.909	1.417	.602	.667	1.613
4	.980	1.250	2.941	2.000	.935	2.326	1.961	.524	1.667	.847	.855	3.333
5	.971	2.083	4.762	2.632	1.818	2.703	.157	.794	1.493	.719	.901	2.381
6	.909	1.587	5.000	2.632	2.778	3.448	1.754	.962	1.639	.901	.763	3.125

Trouble-Acknowledgement-Partial

1	2.083	.050	.565	1.205	.067	.877	.667	.769	.671	.386	.943	1.754
2	.592	.493	.658	.476	.408	1.667	.571	.704	1.429	.413	1.156	1.266
3	.483	1.220	1.205	1.299	2.941	1.110	.758	.141	2.564	.521	1.370	1.587
4	1.539	.321	.518	1.000	1.493	1.695	.641	1.351	1.923	.495	1.351	2.381
5	.709	.377	.800	1.124	1.149	1.786	.568	1.852	2.000	.535	1.587	1.539
6	1.887	.518	.840	.952	1.667	1.111	.840	1.587	1.613	.461	.474	1.887

TABLE IV--Continued

No Trouble-Acknowledgement-Continuous

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
1	.787	.240	1.754	.356	.210	.575	.412	1.111	2.000	1.493	.455	2.083
2	.546	.367	1.149	.676	0	.204	.405	.524	1.734	1.429	.578	1.563
3	.870	.641	1.639	.505	.175	.213	.549	.943	.000	.704	.625	1.754
4	.943	1.075	.769	.763	0	.073	1.316	.800	.893	1.639	.709	1.613
5	.641	1.316	.909	.806	.485	.435	.847	1.087	.980	1.235	.719	1.235
6	.146	1.136	1.075	1.149	0	.353	.503	1.539	1.064	.935	.806	1.333

No Trouble-Acknowledgement-Partial

1	.182	.347	.277	0	.488	.588	.800	1.177	1.282	.575	.446	.469
2	.332	1.053	.263	0	.498	.248	.935	1.587	.546	.800	.602	.461
3	.481	1.370	.265	.124	.637	.379	1.149	1.961	.704	1.961	.787	.268
4	.483	.794	.885	1.177	.909	1.163	1.136	1.734	1.351	1.064	.885	.327
5	.435	1.087	1.110	1.515	.588	.546	1.177	1.333	.503	1.458	.746	.094
6	.613	1.282	.833	2.222	.862	.943	1.351	1.010	1.786	1.852	.694	1.587

TABLE IV--Continued

Trouble-Full-Continuous

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
1	1.563	.146	2.381	.885	.769	1.351	.455	.877	.380	.840	.592	.901
2	1.734	.781	2.273	.242	.885	1.639	1.031	1.177	.709	1.110	.591	1.177
3	1.149	.552	3.030	.787	.725	1.667	.606	1.191	.775	1.429	1.695	.685
4	.667	.763	2.326	.498	.658	1.235	.336	1.818	.855	1.370	1.471	.241
5	1.042	1.539	2.041	.543	.962	1.299	.847	2.500	1.305	1.389	1.754	.302
6	1.370	1.923	2.703	.877	1.786	1.235	.565	1.563	1.266	.877	2.500	.340

Trouble-Full-Partial

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
1	.758	.667	.452	.437	1.613	.467	0	0	1.695	.538	.909	.610
2	.758	.826	.488	.806	1.409	.694	.272	.568	1.695	.469	.840	1.429
3	2.174	.633	.538	.893	1.177	.641	.610	.662	1.515	.283	1.449	1.563
4	1.389	.813	.586	.971	1.316	.546	.719	.395	1.667	.163	1.613	1.923
5	.575	.704	.633	.725	.840	.752	.667	.565	1.429	.578	1.613	3.571
6	.917	.546	.571	1.887	1.370	1.136	.855	.588	.971	.332	1.449	3.448

TABLE IV--Continued

No Trouble-Full-Continuous

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
1	.258	0	.658	.592	.267	.431	1.235	.076	0	.079	.370	0
2	.410	.926	.820	.592	.645	.383	0	.288	0	0	.990	.709
3	.488	1.064	.893	.549	1.042	.251	.578	.286	0	.089	.690	.862
4	.633	1.539	1.429	.565	.962	.391	1.229	.280	0	0	.820	1.409
5	.741	1.563	1.333	.415	.962	.595	.775	.235	0	0	1.124	1.493
6	.741	2.439	1.266	.488	.962	.389	.726	.380	0	.144	1.136	1.449

No Trouble-Full-Partial

Trial	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6	Subj. 7	Subj. 8	Subj. 9	Subj. 10	Subj. 11	Subj. 12
1	.385	.171	.893	.662	.746	.426	.538	.461	.342	.840	.452	.474
2	.833	.234	.885	.658	.714	1.429	.800	.649	.671	.926	.592	.481
3	.769	.188	.602	.595	.909	.585	.599	.685	.599	1.471	.714	.595
4	.676	0	.633	.813	.741	.676	.621	.538	.581	1.587	.813	.581
5	.769	.373	.690	.833	.909	.855	.654	.714	.521	1.299	.893	.621
6	.917	.606	.588	.617	1.282	.685	.617	.781	.714	.813	.826	.515