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EXPERIMENTAL ANALYSIS OF SOCIAL
REINFORCEMENT

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4. Experimental Analysis of Social Reinforcement: Terms and Methods*

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A set of operational and functional terms useful in describing social behavior is defined. New methods of directly recording and programing social reinforcers are briefly described. The emergent properties of social over nonsocial reinforcement require new terms and methods and a higher order discipline.

SOCIAL BEHAVIOR is the term applied to a large class of behavioral interactions, or relationships, between two or more individuals. It has been defined as "the behavior of two or more people‡ with respect to one another or in concert with respect to a common environment."¹⁶

Although social behavior (defined as the interaction between two or more organisms) is generally more complex than nonsocial behavior (defined as the interaction between an organism and his mechanical environment), nonsocial behavior can be made just as complex as so-

cial behavior and it lends itself more readily to experiment. Therefore, the reason for studying social behavior is not its complexity.

The primary reason for studying social behavior is to determine the laws or variables that emerge in social situations. The aspects of social behavior of greatest interest to social psychologists, psychiatrists and clinicians are the supposed "social emergents." For example, if an individual can co-operate with a machine and with people of certain races but not with people of other races, he has a social problem, a social bias, a racial bias.

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‡Whether the term "social" should be restricted to interactions between two humans, two primates, two animals or two living systems cannot be decided here. We face a continuum that is dichotomized only with difficulty. Probably the term will fall into disuse as more exact, detailed terms are developed for socially emergent, specific behavioral properties. Personally, I prefer to use the term "social" to describe interactions between two or more members of the animal kingdom.

This is not an individual behavioral deficit, because the individual's co-operation with the machine and with certain classes of people clearly shows that he is motivated and that he is capable of making the complicated discriminations required by the co-operative task. His inability to co-operate with people possessing specific racial characteristics is a social emergent that may be of interest.

It may be that much of what is generally considered to be "social" behavior will be shown to follow the same laws as individual behavior, the only difference being that in social situations the stimuli are presented by another organism. For example, many "sexual deviants" may simply be people who cannot form the complicated discriminations demanded in social or sexual situations. Since they are able to meet the less complicated requirements of other situations, they may appear sexually deviant when they are merely deficient in the ability to make the discriminations required in social situations. The character Lennie in *Of Mice and Men* is a fictional example of such a misinterpretation.¹⁸

In order to determine experimentally whether truly social emergents exist and whether social psychology is necessary as a separate discipline, it is essential not to confound variables when comparing nonsocial and social tasks. An ideal method for experimentally analyzing social emergents would permit studying highly complicated nonsocial behavior in exactly the same way as social behavior is studied. In this way, social variables could be added one at a time while their effects on the behavior of individuals were objectively measured. The method of free-operant conditioning meets this requirement and has been successfully used for this purpose.^{1, 2, 7}

ADVANTAGES OF FREE-OPERANT CONDITIONING METHODS

Over the past 25 years free-operant conditioning techniques have been developed for the investigation of the adjustive behavior of individuals in fully controlled experimental environments.^{15, 17} When a subject *operates* a lever, button or similar device, he is *reinforced* by the presentation of a rewarding event or the withdrawal of an aversive event, hence the term "operant." Since the subject is *free* to respond at any time during the experimental session, the rate of occurrence of the response can be recorded as the primary datum. For these reasons, the free-operant method of conditioning very closely approximates the free and adjustive behavior of individuals in their natural environments.

Several outstanding advantages of free-operant methods make them especially appropriate for the investigation of human social behavior:

1. A large body of data on the nonsocial behavior of individuals has been accumulated. This information is invaluable for reference in applying the method to complex social situations.

2. Full and automatic control of the experimental environment permits isolation of variables and determination of the effects of single variables.

3. Automatic presentation of stimuli and automatic recording of responses completely eliminate observer bias, which often plagues experimenters using less highly controlled methods.

4. The sensitivity of the method to the behavior of single individuals eliminates the need for group research designs. This sensitivity to individual behavior promises to be extremely important in social behavioral analysis.

5. A large number of useful and in-

mension for the description of social events. For example, reinforcing stimuli can be presented (a) *individually*,* whereby only one individual is reinforced at a time with reinforcement available only to him; (b) *mutually*, whereby all individuals in the group are reinforced at the same time with events available to themselves only and not to the other members of the group; (c) *jointly*, whereby each individual receives a portion of an event that is not reinforcing in itself but, when joined with events received by others in the group, becomes a reinforcing event (for example, one person gets an onion, another some meat, another some potatoes, and another a pot of water—the joint reinforcement is stew); (d) *communally*, whereby a single reinforcing stimulus is presented to the group and is available to all individuals within the group, who may compete for all or part of it, or agree to divide it.

The other forms of social stimulation, that is, previous histories, eliciting stimuli, and facilitative stimuli, can be presented individually, mutually, jointly or communally. Also, responses can be permitted to occur individually, mutually, jointly or communally.

3. *Direction of stimulation.* The direction of stimulation is important in accurately describing social interaction. Social interactions can be divided into three clear-cut types, depending upon the presence or absence of social stimulation and its direction within the group: (a) pseudosocial grouping, (b) unidirectional social behavior, (c) bidirectional social behavior.

Pseudosocial grouping requires no cross stimulation between the members

of a group in order to maintain the behavior. If the so-called social behavior is maintained after a total communication barrier is inserted between the two members of the group, the behavior is pseudo-social. Many symbiotic relationships are probably of this sort. The fable in which the cow and the horse “co-operate” in pushing down a fence to reach greener grass on the other side probably represents such a relationship. The horse might also have been able to “co-operate” with a high wind. Or even worse, a high wind and a fallen tree might “co-operate” in pushing farmer Brown’s fence down!

Unidirectional social behavior exists when only one member of the dyad is dependent upon the other for stimulation. Stimulation must occur between the two members, but it need proceed in only one direction. If the behavior breaks down with a total stimulation barrier but is maintained with a one-way communication barrier, the behavior is unidirectional. Co-operative and competitive behaviors are unidirectional when leader-follower relationships can be maintained without change. The leader is the stimulus producer, and the follower responds to these stimuli.

In *bidirectional social behavior*, both members of the dyad must respond to each other to maintain the social behavior. In this case, the behavior would break down if a total or even one-way communication barrier were placed between the two members of the group. Only when two-way communication is permitted can the behavior be maintained. Bidirectional social behavior can be simultaneous or successive. In *simultaneous* bidirectional social behavior,

*In describing these four categories of availability of social events, the terms “group” and “team” were avoided because of so many conflicting prior usages and because of the lack of adverbial forms.

both members of the dyad must be able to respond simultaneously to stimuli produced by each other. *Successive* bidirectional social behavior consists of an alternating combination of unilateral social behavior that demands at one time that individual *A* respond to stimulation produced by individual *B*, and at another time that individual *B* respond to stimulation produced by individual *A*. This interlocking bidirectional social behavior is found in many competitive games in which leadership must be alternated, as in alternation of the serves in tennis.

Bidirectional social behavior, apparently the most complicated, places the greatest demands upon all members of the group. Since unidirectional social behavior demands social responding from only one member of the group, the other member may be entirely ignorant of the socially responding teammate.

4. *Aspect of organism.* The aspect of each organism that stimulates or summarizes with the responses of the other organism in the dyad is often useful in describing social experimentation. A social event may be: (a) the mere *presence* of the other individual, (b) an *actual response* (movement) of the second individual, or (c) a *mechanical event* produced by the response of the second individual (this is actually social programming of nonsocial events, on a fixed-ratio schedule in this case). Furthermore, the physical presence and response of the individual may be partial (for example, words, photographs, television images, movies) or complete with the person actually present in the experimental enclosure with the other teammate. The use of closed-circuit television systems permits presenting the visual and auditory aspects of one individual actively responding to the second member of the dyad

without the second member being able to respond to his teammate or without his even knowing of the second individual's presence. Prior to the discovery of television, it was impossible to manipulate independently all aspects of such dynamic two-person interactions.

5. *Nature of transaction.* Although not as useful for actual design of social experiments as the previous four dimensions, the nature of the transaction has proved useful in describing our own research in society, and permits comparison with nontechnical treatises. Also, it is within this dimension that we search for clinically validating correlates, when estimating the importance of our work for society, and when deciding which areas should be instrumented first.

The following terms, most of which are single-word complements, illustrate this dimension:

- ImitationIllustration
- ObservingDisplaying
- AltruismSadism
- RewardingPunishing
- Opportunity-creatingTrapping
- LeadingFollowing
- Co-operationCompetition

These transactional terms are old and are found in the dictionaries, as well as in the talk of faculty colleagues, co-citizens and family members. We use them to tell people what we think we are studying—in the titles of our papers.

EXEMPLARY METHODS FOR EXPERIMENTAL ANALYSIS OF SOCIAL REINFORCEMENT

Since space does not permit full coverage of the many interesting modifications of the method of free-operant conditioning for the experimental analysis of social reinforcement, we will include only two

methods as examples. The first shows how the reinforcing power of social stimuli can be directly and continuously measured using intermittent schedules of episodic reinforcement. For a more detailed description of these schedules, see Ferster and Skinner.³ The second example involves a new schedule of reinforcement developed in our laboratory to permit the use of continuously available reinforcing stimuli. Many social reinforcers, such as dramatic and musical entertainment media, lose much of their reinforcing value if they are broken into segments for episodic presentation.

Intermittent schedules of episodic reinforcement. FIGURE 1 shows a device for experimentally measuring the reinforcing value of observing a hungry kitten drink milk that is presented to the kitten contingent upon the response of the experimental subject.⁴ The subject's

response is to pull the lever shown in the figure. The subject's reinforcing stimulus is the drinking of the milk by the kitten. This is arranged by presenting the dipper to the kitten, which has previously been trained to drink from it. The high motivation of the kitten and his previous conditioning insure that the dipper presentation produces drinking behavior. The dipper can be presented on any of numerous intermittent schedules of episodic reinforcement. The rate of the subject's responding (pulling the lever) indicates the reinforcing value to him of observing the kitten's drinking response. This can be considered as experimental "altruism," "charity" or "succor." The behavior is unidirectional, since a one-way screen between the subject and the kitten permits the subject to observe the kitten, and preventing the kitten from observing the subject does not destroy the behavior. In other words, the subject

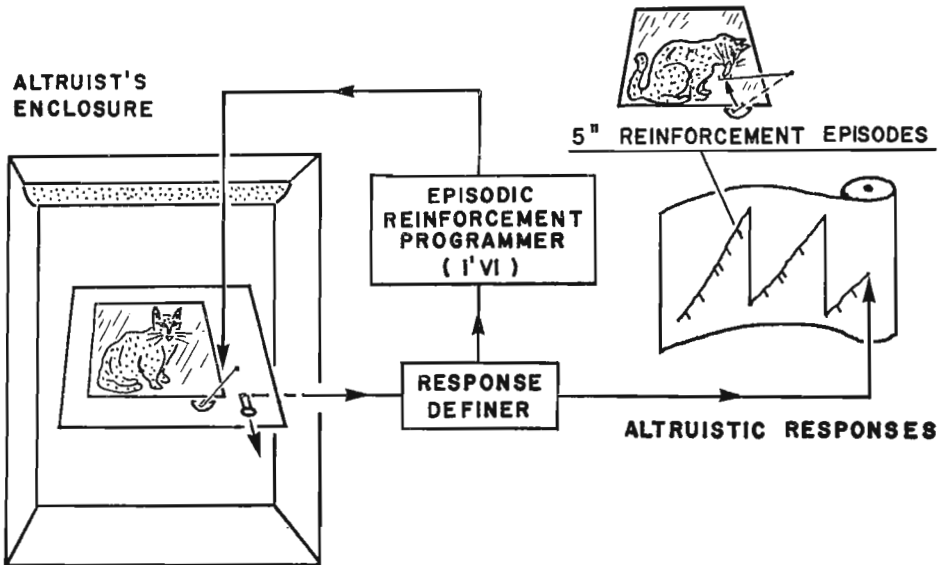


FIGURE 1. Schema of apparatus for measuring amount of reinforcement to a person in giving a hungry kitten a lap or two of milk (Infanto-felino-altruism?). Since the kitten was permitted to drink only in five-second episodes, the subject's altruistic lever-pulling was reinforced on an episodic reinforcement schedule.

is engaging in social interaction and is being socially reinforced, but the kitten is being nonsocially reinforced.

If an electrical grid were placed under the kitten's feet, electrical shocks to the kitten's feet could be made contingent upon the responding of the subject. This simple change in the apparatus would permit measurement of the aggressive behavior of the subject ("sadism") as he pulled the lever to punish the kitten. Furthermore, human subjects, responding to appropriate reinforcers and punishers, can be substituted for the kitten in this experiment. In this way altruistic and sadistic transactions can be directly measured.

Other more complicated forms of altruism could be developed by having the response of subject *A* produce a reinforcement both for himself and for another subject, *B*, who could be seen in an adjoining room. If subject *A* responded at a higher rate to produce reinforcement for both himself and his neighbor than to produce reinforcement for himself

alone, he could be considered altruistic. It is easy to construct situations in which subject *A* has two levers in front of him, one to produce reinforcement for himself and one to produce reinforcement for a neighbor whom he can see through a window. In such a situation, the ratio of subject *A*'s responding on the two levers would represent his "charity ratio." Space does not permit discussion of all the interesting possible combinations and permutations of such experimental designs, or a review of the literature in which words, doll play and other social reinforcers have been used in similar fashion.

Conjugate reinforcement contingencies. FIGURE 2 is a schematic diagram of the experimental arrangement for the presentation of silent movies that are conjugately contingent upon panel-pushing responses by a human infant. The infant lies in a small bassinet with his feet against a panel, which can be depressed approximately one inch. A

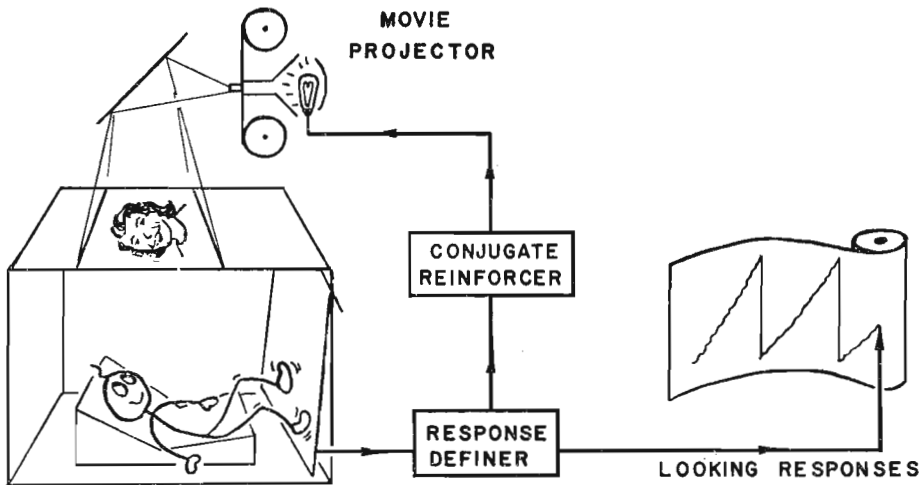


FIGURE 2. Schema of apparatus for measuring reinforcing value of silent movies to a human infant. The continuously available moving picture is presented on a conjugate reinforcement contingency. This contingency appears most suitable for social reinforcers.

switch output from this panel goes to a response definer that prevents "holding" responses by converting the switch operations into impulses. The output of the response definer is fed into a cumulative recorder, which records the panel-pushing response rate. The output also enters a conjugate reinforcement mechanism that briefly increases the intensity of the projection lamp with each response. Thus, rapid pressing of the ^{panel} pedal makes the projector lamp grow brighter and brighter, thereby relating the rate of panel-pushing directly to the intensity of the moving picture projected on the back of a translucent screen in the ceiling of an air-conditioned, sound-proofed experimental enclosure. These contingencies make the panel-pushing response a looking response.

With this method we have been able to obtain high, sustained rates of responding from a five-month-old infant reinforced with a movie of a strange woman smiling. In other words, the smile of a female stranger is reinforcing to a five-month-old infant. Other pictorial materials can be presented in this way to persons of any age, to determine the materials' reinforcing value.* We had previously found that episodically presented photographs of smiling female faces produced occasional responses in the human infant, but not a high, sustained rate of response. Therefore, it appears that the conjugate contingency is much more appropriate for the presentation of social reinforcers.

These conjugate reinforcement contingencies have been used in a wide class of human situations and show promise for use in the presentation of a wide va-

riety of socially reinforcing stimuli.^{5,8,10-12} We are currently refining and testing experimental apparatus for experimental analysis of the therapist-patient dyad, probably one of the most complicated social relationships available for experimental analysis (for a more complete description see Lindsley¹⁰). The therapist is in one experimental room and the patient in an adjacent room. Visual and auditory communication between the rooms are controlled both in degree and direction by the use of closed-circuit television cameras and receivers. The patient has two switches, or operanda, in front of him. A rapid rate of pressing one operandum brings the therapist into visual focus on a television screen in front of the patient. Rapid pressing of the other operandum increases the intensity of the therapist's voice heard over a loud speaker in the patient's room. The rates of pressing these two operanda are recorded in another room on cumulative response recorders. Variations in the rates of these two responses indicate the immediate reinforcing effects of the therapist's movements on one recorder and the therapist's speech on the second recorder. Fluctuations in these rates of responding indicate subtle changes in the degree of transference within psychotherapeutic sessions. Correlations of these rate variations with the verbal content of the communication between patient and therapist will reveal and test many of the dynamics involved in therapeutic sessions.

SUMMARY

Operational terms consistent with

*A wide variety of apparatuses for conjugate reinforcement with social reinforcers is commercially available from Behavior Research Company, Belmont 78, Massachusetts.

free-operant conditioning nomenclature and useful in describing experimental analysis of social behavior have been presented. The complexity and detail involved in such operational terms exceeds expectation. Most existing social research has confounded the variables described by these terms. Much interesting, highly controlled research must be done before the nature and direction of operation of these previously overlooked variables will be known.

Examples of methods of directly recording effects of social reinforcement and of automatically presenting continuous social reinforcers (conjugate reinforcement) have also been described. An interesting application of free-operant methods was mentioned, in which closed-circuit television separating therapist and patient permitted direct experimentation upon ongoing psychotherapeutic relationships.

Social psychology is necessary as a separate and higher order discipline above individual psychology. Social emergents require this. The requirements for careful operational terms, for high experimental control and for continuous and functional measurement exceed those for research on the behavior of single individuals. Therein lies the challenge to social scientists and the test of our skills and creativity.

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