ACQUISITION AND MAINTENANCE OF TRUSTING BEHAVIOR

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This study determined whether a two-person exchange situation contained natural contingencies for trusting behavior or whether external contingencies were necessary. Pairs of college students worked matching-to-sample problems for money. On each trial there was one problem and the subjects determined which of them would solve it. Trusting behavior was defined as an increase in the number of consecutive problems each subject allowed his partner to work during sessions that also ended with an equitable distribution. Simply, trust was a temporary deviation from equity. A subject could give the problem to the other person (cooperate), or not respond and let the other person take the problem (share). Other possibilities were for both subjects to try to take the problem (complete), or for neither subject to respond and thereby let the person who worked the last problem also work the next one (passive trust). When only four lever pulls were required to distribute a problem (no external contingencies to reach either equity or trust) subjects reached equity, but only minimal trust (strict alternation of single problems) developed in 18 sessions. When 30 or 60 lever pulls were required to distribute a problem (smaller response requirement for passive trust and therefore a contingency for trust), trusting behavior developed after a few sessions (fixed ratio 30) or after several trials of the first session (fixed ratio 60) and it ordinarily expanded gradually to 10 to 15 consecutive problems through passive trust. The aversiveness of the inequity involved in trusting appears to necessitate a contingency for acquisition. Once trust develops, however, this aversiveness is reduced as subjects learn the inequity is only temporary (e.g., once trust was acquired at fixed ratio 60 it was maintained at fixed ratio 4, which would not initially produce it), and the direction of the inequity appears to become of questionable importance (e.g., being behind was alternated over rather than within sessions and usually not in a systematic manner).

Key words: acquisition of trusting behavior, maintenance of trusting behavior, minimal trust, maximal trust, cooperation, sharing, expansion of trust, passive trust, competition, verbal negotiation, humans

Most studies of social exchange have examined factors that determine whether subjects divide reinforcers equitably or inequitably. Assuming no special claim to the reinforcers by one of the participants (e.g., as in business where one partner might own more of the business), an equity effect may be defined as an increase in the correspondence of the numbers of the participants' reinforcers. Similarly, a decrease in correspondence is defined as an inequity effect. The major equity

and inequity effects have been differentiated in terms of the response modes of giving and taking (Hake, Vukelich, & Olvera, 1975a). In cooperation where the major equity effect involves giving, subjects give about the same number of reinforcers to each other. In sharing, the second major type of equity effect, the subjects each take about the same number of reinforcers, but unlike competition only one subject attempts to take each reinforcer. In competition, where the major inequity effect involves taking, both subjects attempt to take the same reinforcer. Altruism, the other major inequity effect, involves giving, but it differs from cooperation in that one subject gives more than the other. The following example illustrates a change from competition to sharing and, consequently, an equity effect. In the first session of an experiment, each of the two subjects emit taking responses for the single reinforcer available on each trial (com-

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petition) with the result that at the end of the session one subject has 35 reinforcers and the other has 5. This is an inequitable distribution of reinforcers because neither subject has a special claim to more reinforcers. In the next session the subjects alternate taking reinforcers so that only one subject emits a taking response on each trial (sharing) and each subject ends the session with 20 reinforcers. The increased correspondence of reinforcers indicates an equity effect, which in this example is sharing.

Trusting behavior may also be defined in terms of correspondence or equity, and here it will refer to temporary deviations from equity that occur during an overall equitable relationship. The role of trust in cooperation and other equity procedures was first suggested by Deutsch (1958), but the relationship has been studied by only a few psychologists and sociologists (e.g., Blau, 1964; Deutsch, 1958; Homans, 1974; Matthews, 1977; Thibault & Kelly, 1959). At least minimal trust is involved in cooperation and sharing when two persons alternate giving or taking reinforcers and one person is given or takes a reinforcer that puts one of them one reinforcer ahead of the other person. Maximal trust occurs when subjects split the reinforcers in a session (e.g., 40) by one subject taking the first half, one trial at a time, and then the other subject taking the second half. Thus, the extent of trust can be defined by the magnitude of differences in reinforcers obtained by the two subjects (deviations from equity) within a longer period of cooperation or sharing (i.e., a period when an equity effect eventually is reached). Viewed in this way, equity with maximal trust would be considered as on the same dimension as equity with minimal trust, but as a more advanced equity effect.

In the present research, trusting behavior is graphed in terms of consecutive reinforcers received to show the increase in trust beyond the nearly continuous equity involved in minimal trust, i.e., the strict alternation of reinforcers. The essential ingredients of a trust procedure are: (a) that responding can result in deviations from equity, but (b) equity is possible due at least in part to the behavior of the other person. Trusting behavior or a trust effect is indicated by an increase in intrasession inequity, the absence of competition, and equity at the end of the session or the period of co-

operation. This definition of trust is similar to previous definitions (e.g., Deutsch, 1958; Matthews & Shimoff, 1979) in that trusting (giving another individual a reinforcer or allowing another individual to take a reinforcer) can involve cost in the form of lost reinforcers if trust is not reciprocated. In addition, our definition assumes that trusting behavior occurs only during an equity effect; hence, the potential cost of trust is measured as a deviation from equity. However, this definition of trust, unlike the one proposed by Matthews and Shimoff (1979), does not require an individual to be behind or to have a potential for cost to show trusting behavior. When Subject A is behind and allows Subject B to obtain consecutive reinforcers, trusting behavior may be at a higher level than when Subject A is ahead and allows Subject B to obtain consecutive reinforcers. But both levels will be designated as trusting behavior as long as equity is eventually reached through noncompetitive methods. The minimal definition of a trust effect, temporary increase in inequity within a context of equity, requires each of the above two levels of trusting behaviors to occur, one level by each subject.

There are also two types of trusting behavior. In "active" trust one of the subjects has to emit a response to distribute each reinforcer. For example in a study by Matthews (1977), trust consisted of a subject responding in a way that gave several consecutive reinforcers to the partner before the partner reciprocated. In "passive" trust the person who received the last reinforcer continues to receive reinforcers on subsequent trials as long as neither participant responds to change the distribution of reinforcers. An example of passive trust from everyday life would be allowing a partner of a company to keep a valued object such as the company car until he returned it or it was asked for rather than checking it in and out of the company garage every time he used it. When a large number of responses is required to distribute a reinforcer, passive trust requires less work and may be preferred for this reason.

One explanation of the acquisition of trusting behavior is that it develops directly and naturally from the contingencies inherent in a developing social relationship. For example, we have observed both cooperation and sharing to develop without an external contingency (Hake et al., 1975a; Hake, Olvera, & Bell,

1975b; Olvera & Hake, 1976). In experiments that involved sizeable but equal response requirements for competition, sharing, and cooperation, one natural contingency that accounted for the transition from competition to sharing or cooperation was the fact that competition requires more work, because individuals try to take each reinforcer as opposed to alternating or dividing the response requirement as in sharing and cooperation. (Hake et al., 1975b; Olvera & Hake, 1976). Other natural contingencies which might lead to a change from competition to either sharing or cooperation include the aversiveness of inequity (Marwell & Schmitt, 1975; Shimoff & Matthews, 1975) and the aversiveness of the emotional side effects such as aggression that can occur during competition.

However, in the above research where equity was reached, subjects have ordinarily shown only minimal trusting behavior (i.e., strict alternation of giving and taking reinforcers. Alternation by blocks of as many as five consecutive reinforcers was rare. This absence of trusting behavior in previous research can be viewed in the light of the research which shows that subjects who have reached an equity effect will avoid inequities such as unequal payoffs even when such differential payment would result in more reinforcers for either one or both of them (Marwell & Schmitt, 1975; Shimoff & Matthews, 1975). These studies suggest that temporary inequities including those involved in trust have an aversive aspect. Furthermore, if trust does have aversive aspects, it may not emerge from a developing social relationship without some external contingency for this behavior. The latter notion received support from Matthews (1977), who found that subjects did not trust in the two baseline sessions without a contingency to trust, but did after a punishment contingency was introduced. In that study, subjects could respond individually for monetary reinforcers or subjects could give reinforcers to each other. Subjects usually gave reinforcers, because giving paid more, but they alternated giving one reinforcer at a time. However, trusting behavior did emerge after not trusting was punished in the form of loss of money for each alternation. The switch to trust was nearly immediate, and it increased to maximal levels by the second session.

There is a limited amount of data concerning the contingencies necessary for the acquisi-

tion and maintenance of trust. The present research explored several questions. First, does a two-person social situation contain natural contingencies to produce trusting behavior when many sessions are allowed? Second, does trust develop or develop as abruptly when there is a less instructional contingency than was used in the studies of Matthews and Shimoff? In those studies changing the conditions to punishment for nontrust may have served to instruct the subjects that what they were doing was "wrong" and that trust was "right." Also, in those studies cooperation paid more than individual work. This question is related to the problem of how trust develops when there is no extra reinforcement for an equitable solution and all major inequitable (e.g., competition) as well as equitable social solutions are possible. Third, if trust does develop, does it expand gradually or abruptly? Fourth, if acquisition of trusting behavior does require an external contingency, does the maintenance of trusting behavior require that contingency? In Matthews (1977) and Matthews and Shimoff (1979), trust endured when the punishment contingency was removed.

In the present experiment, the reinforcer was money, which was earned by working matching-to-sample problems. One problem was available on each trial. Subjects could respond by giving the problem to their partners or could take the problem for themselves. In this way subjects could cooperate (e.g., alternate giving responses), share (e.g., alternate taking responses), or compete (e.g., both try to take the reinforcer). Subjects could also passively trust by not responding, thereby allowing the person who worked the last problem to work the next one. To determine if the two-person situation contained natural contingencies to trust, some pairs were tested for several sessions with a small number of responses required to distribute problems. Other pairs were tested with larger response requirements to determine if increased work might produce a switch to passive trust. When trust developed in the latter subjects, the response requirement was decreased to determine if trust would endure without an external contingency. A between-subjects (pairs) design was used to observe and to compare the acquisition of trust under different conditions, and to eliminate changes in experimental conditions that might serve as a signal that the subjects

should also change their behavior (i.e., to trust).

METHOD

Subjects and Payment Procedures

The subjects were 26 college students from lower division psychology courses who responded to an announcement requesting paid participants. Each person was shown the apparatus, had the tasks involved in the experiment explained, and the methods of payment described. At this time they were also told that the experiment would last at least 5 days and probably 9 or 10, and were asked to sign a consent form indicating their willingness to participate. The subjects were divided into 13 same-sex pairs with 1 female pair in each of the three conditions described below.

Ordinarily there were two sessions per day for 4 or 5 days of the week so that the total experiment for a given pair lasted approximately two weeks. In addition to session earnings of about \$2.25 per day, subjects received a bonus of \$.75 per day for attending five consecutive days; hence, daily earnings averaged about \$3.00. The bonus was paid to encourage regular attendance and to increase earnings in pairs where the subjects competed and one of them earned little money during the session. To reduce the possibility of subjects splitting their earnings, thereby producing equity outside the experiment but not necessarily during it, each subject was paid separately and on a different day every 4 or 5 days. If a subject missed a session, the subject who did attend

was paid the \$.75 bonus and about half (\$1.25) of the usual session earnings.

Each block of 3 sessions consisted of a 16-, 20- and 24-minute session. Session length was varied in an irregular order to reduce the possibility of subjects reaching equity by each of them taking all of the problems on alternate days or alternate sessions instead of dividing the problems within a session.

In addition to the monetary payments, most subjects also received bonus points in their classes for research participation.

Apparatus

The apparatus was similar to that described in earlier reports (e.g., Hake, Vukelich, & Kaplan, 1973) which may be consulted for exact dimensions. Each member of a pair had a sample panel for producing sample stimuli (left side of Figure 1) and a matching panel for matching responses (right side of Figure 1). The matching panels were mounted, back to back, on the same table about .75 m apart. The back-to-back positioning of the matching panels, plus an extension at the top of each matching panel where instructions were placed (not shown), prevented the seated subjects from seeing each other's responses. Each subject's sample panel was in easy reach, next to the matching panel.

About equidistant from each side of the matching panels, from top to bottom, was an opening through which the number five was projected to indicate the five-cent value of each problem (magnitude-of-reinforcement stimulus), a light that flashed when the subject responded on one of the distribution levers

Fig. 1. Diagram of the sample panel (left) and the matching-response panel (right) of one subject.

(feedback stimulus), three pairs of buttons labelled with the letters P and T, K and H, V and R respectively for each pair (matching response buttons), and a button that was to be depressed before talking (conference button).

Two Lindsley manipulanda (distribution levers) were located on the left side of the matching panel. Pulls on these levers with a 6 pound (26.7N) force distributed the matching-to-sample problem on each trial. A subject could take a problem (taking response) by completing the fixed-ratio requirement (FR) on the top lever. Similarly, a subject could give a problem to the other subject (giving response) by completing the same FR requirement on the bottom lever. Two lights (distribution lights), one green and one brown, color-coded to match the color of each subject's matching panel, were located directly above the distribution levers. Illumination of both lights indicated the start of a trial and that responses on the distribution levers were now effective. At the end of the time allowed for distribution of the problems, one of the lights went off. The color of the light that remained on corresponded to the color of the matching panel where the problem could be worked. Two more lights (coactor-response feedback lights), located above the distribution lights, indicated to each subject whether the coactor was responding and on which distribution lever. Two counters labelled "me" (self-audit counter) and "other person" (coactor-audit counter), covered with one-way glass, were mounted on the right side of each matching panel. The subjects' scores were recorded on these counters. Five presses on the button (audit button) corresponding to a particular audit counter illuminated the area behind the one-way glass for 5 sec so that a subject could view the score on that counter.

The sample panel was fastened to a stand, which put it at eye level of the seated subject. When the light (sample-operative stimulus) located on top of the panel was illuminated, pressing the button (sample-producing button) at the bottom of the panel produced a letter for 1 sec in each of the three openings on the panel face. One of two letters randomly appeared in each opening: The letters were P or T, K or H, V or R, the same as those on the matching-response buttons.

The experimental room, approximately 3m by 3m, also contained a closed circuit television camera, an intercom unit, and a timer

which indicated the number of minutes remaining in the session; all were in full view of the subjects. The camera and intercom permitted continuous visual and auditory monitoring. The television screen, the microphone speaker, and the scheduling and recording equipment were in an adjacent room.

Procedure

General procedure for distributing and completing problems on each trial. Depending on whether the session was 16, 20, or 24 min in length, a session consisted of 36, 46, or 55 trials respectively, with one matching-to-sample problem available on each trial. Each problem was worth 5 cents if completed correctly.

The sequence of events during a trial was as follows. Each trial began with illumination of the magnitude-of-reinforcement stimulus, which presented the five-cent value of the upcoming problem and remained on for the next 25 sec. One second after the onset of the magnitude-of-reinforcement stimulus, one of the color-coded distribution lights came on to indicate which subject would receive the next problem to work if neither of the subjects changed the distribution by responding on a distribution lever (passive trust). Two seconds later, both distribution lights were lit, indicating that the distribution levers were now operative. If the first subject to complete the ratio within 15 sec completed it on the take lever, the coactor's distribution light went off, and the first subject's sample panel was illuminated, allowing the problem to be worked. If the first subject to complete the ratio completed it on the give lever, the first subject's distribution light went off, the coactor's sample panel was illuminated, and the coactor could work the problem. If neither subject completed the ratio requirement within 15 sec, the problem was automatically distributed to the subject who had worked the last problem (passive distribution). Working the problem consisted of first producing the sample stimuli for 1 sec by pressing the sample-producing button, and then matching the sample stimuli (e.g., P,K,R) by pressing the matching-response buttons on the matching panel that corresponded to the sample stimuli (e.g., P,K,R). If the subject pressed the correct matching-response buttons, five points (cents) were counted on his self-audit counter, and five points were counted on his coactor's coactor-audit counter. Subjects

had ample time to work the problem. When the problem was passively distributed, the subjects had 7 sec after the 15-sec distribution interval. When they distributed a problem by responding during the distribution interval, they had 7 sec plus the remaining time in the distribution interval (e.g., if they took the problem after 10 secs, they also had the 5 secs left in the 15-sec distribution interval). At the end of the 25-sec period beginning with the onset of the magnitude-of-reinforcement stimulus all lights on the matching and sample panels were darkened and problems could not be worked. One second later, the magnitude-of-reinforcement stimulus came on again, indicating the beginning of another trial.

Five button presses illuminated an audit counter. Subjects were allowed to talk during sessions but they were asked to depress the conference button as long as they talked. However, no one was penalized for talking without depressing the conference button.

Instructions and Training

At the start of the study, one subject at a time was seated in front of a matching panel and told that the panel could be used to work problems which, if worked correctly, were worth five cents each. The subject was then read instructions that indicated the function of each part of the matching and sample panels and the sequence of events on each trial. These instructions remained affixed to the top extension on each apparatus and are provided in entirety in the Appendix. The three methods of distributing a problem were described and each subject was then allowed to distribute two problems by taking, giving, or by doing nothing. The subject was told that problems could be distributed by both subjects responding, one subject responding, or neither subject responding, and that any way they did it was "okay". That instruction, plus instructions about the duration of the session constituted the abbreviated instructions that were given before the first session of each subsequent test day. Only information about session duration was provided prior to the second session when two sessions per day were run. Leather gloves were available to eliminate any possibility of skin irritation caused by pulling the levers.

Questionnaire

The absence of passive trust could have simply indicated that the subjects did not

understand how to distribute problems by withholding responding. Hence, if the pair had not tried the passive trust procedure after half of the sessions were completed (9 sessions), a brief questionnaire asked each subject to describe all the ways to distribute problems and how their pair had been distributing them. The questionnaire was given to all subjects in the FR4 group, Subjects 33 and 34 and Subjects 13 and 14 from the FR30 group, and Subjects 9 and 10 from the FR60 group. (Subjects 3 and 4 from the FR30 group qualified for the questionnaire, but they had completed the experiment before the questionnaire procedure was started.) The subjects were told that the questionnaire was given because they were half-way through the experiment. If a subject's responses to the questionnaire did not clearly describe the passive trust option, both members of that pair were asked individually to distribute problems by taking, giving, or not responding. (Subjects 21 and 22 and Subjects 23 and 24 from the FR4 group, and Subjects 9 and 10 from the FR60 group). Descriptions of all three procedures were read to the subjects again if they did not know how to distribute the problems by not responding (Subjects 9 and 10). The questionnaire was given to all subjects at the end of the experiment, and all of them could describe the passive trust procedure at that time, regardless of whether or not they used it.

Experimental Groups

There were three groups which differed in terms of the FR required to distribute problems by giving and taking. Five pairs were assigned to the small ratio (FR4) group, five pairs to the intermediate ratio (FR30) group and three pairs to the large ratio group (FR60). Each pair was told that the experiment would last 9 to 18 sessions or 1 or 2 weeks, but that it usually lasted 2 weeks. Ordinarily subjects were continued for the full 18 sessions in the FR4 and FR30 groups unless trust expanded to maximum level and was stable within 9 sessions (Subjects 7 and 8). For the FR60 group, the ratio requirement was dropped to FR4 after the first 9 sessions and continued for 9 more sessions at the lower ratio. Minor deviations from this basic design are described in the results section. One pair (Subjects 9 and 10) started with FR30, but the questionnaire after Session 9 (after the ratio had already

been increased to FR60) revealed that the subjects did not understand the passive trust option. Since this pair was reinstructed with FR60 in effect, and since the questionnaire revealed passive trust was not really an option for them at FR30, their data from Session 10 and after have been included with the FR60 group. This was one of the first pairs and provided the impetus for the use of the questionnaire procedure with subsequent pairs.

RESULTS

Figures 2, 3, and 4 show the number of consecutive problems solved correctly by each subject and the predominant and secondary methods by which each subject distributed problems to the partner (top of each graph). Only correctly solved problems are plotted, because only correct problems were reinforced and accuracy was high. The only subject averaging less than 95% correct was Subject 52 (85% correct) of the FR60 group. The criterion for a predominant method was based on an equity effect in which each subject worked one-half of the problems in a session. Hence, the predominant method was the one the subject used to distribute over 25% (i.e., half of half) of the problems in a session to the partner. Because the definitions of sharing, cooperation, and passive trust all require equity, these equitable methods of distribution were designated as predominant only when the subjects reached at least 80% correspondence of scores within a session (i.e., the subject with the fewest points had at least 80% as many as the partner). A secondary method was arbitrarily defined as the one involved in distributing 5% of the problems to the partner. The secondary method was important during expanded trust when subjects alternated blocks of several consecutive problems by a predominant method such as passive trust, and then switched to another method in which smaller blocks were exchanged, such as sharing or cooperation, in an attempt to keep scores even at the end of the session.

It is important to remember that these predominant and secondary methods show the behavior of each subject when the subject's partner received the problem. Giving simply means that the subject gave problems to the partner. Sharing, on the other hand, means the subject did not respond while the partner

took the problem. Similarly, in passive trust, the subject did not respond while the problem was automatically distributed to the partner. In competition, however, the subject attempted to take the problem, completed at least half of the ratio requirement, but was slower than the partner who took the problem. In other words, competition indicates the subject lost the problem through competition. The absence of a predominant method (indicated by zero: 0), means that fewer than 25% of the problems were distributed to the partner by one of the above methods of distribution.

Figure 2 shows that four of the five pairs in the FR4 group reached an equitable solution by the first session. Correspondence of scores averaged over 95%. Two pairs had predominant methods of sharing (Subjects 27 and 28; Subjects 31 and 32) and two had predominant methods of giving or cooperation (Subjects 23 and 24; Subjects 25 and 26) although Subjects 25 and 26 frequently had a secondary method of competition. Subjects 21 and 22 competed for the first ten sessions during which correspondence averaged only 54%. This pair reached an equitable solution of sharing in Session 11 (dotted line) and correspondence averaged 99% for the remaining sessions. However, the mean number of consecutive reinforcers any subject received during these equity solutions was consistently only one, or the minimal level of trust. The maximum number of consecutive reinforcers in a session (unconnected dots) did occasionally reach 2 or 3 for Subjects 25 and 26, but this was largely due to the secondary competitive solution which produced occasional deviations from strict alternation. Once an equitable solution was reached for subjects in the FR4 group only minimal trust was shown, i.e. the mean number of consecutive reinforcers rarely changed from 1 and never averaged 1.5 for a session.

For the FR30 group in Figure 3, however, 4 of the 5 pairs developed varying degrees of expanded trust after reaching an equitable distribution of reinforcers. Only Subjects 33 and 34, who consistently shared by taking alternate problems, did not show any increase in trusting behavior. Trust expanded to mean consecutive reinforcers per session of 5 (Subjects 15 and 16), 10 to 20 (Subjects 3 and 4), 17 to 28 (Subjects 13 and 14), or 30 to 50 for

Subjects 7 and 8 who alternated by days with each person taking all of the problems for a particular day (2 consecutive sessions).

Expanded trust for the FR30 group was not evident from the outset. No pair showed anything more than minimal trust during the first session. Subjects 15 and 16 had five initial sessions of predominantly sharing and giving, with expansion of trusting behavior beginning in the fourth session when passive trust became a secondary pattern for Subject 16. Passive trust became predominant in Session 5 (Subject 15) or 6 (Subject 16) with some continued expansion of maximum levels of trusting behavior (unconnected points) thereafter. These subjects provide an example of how the secondary method was used to "even-up" at the end of a session. During the last few sessions these subjects alternated blocks of 10 to 13 (maximum) problems by passive trust but alternated giving or taking single problems at the end of the session such that no subject was ahead by more than one problem near the end of a session. This secondary method, of

course, decreased the mean number of consecutive reinforcers. Even Subjects 7 and 8, who showed largest trust effect, had one session of sharing with strict alternation of problems before they switched to passive trust and abruptly expanded to alternating by days or blocks of 30 to 50 reinforcers per session or about 70 to 80 per day. Subjects 3 and 4 competed for 10 sessions before switching to passive trust at Session 11 (dotted line) and gradually expanding the mean number of consecutive problems. This was the only instance switch to an active type of trusting behavior in which subjects alternated taking 10 to 20 consecutive problems. This was the only increase of active trust. Subjects 13 and 14 competed for one session and then shared in strict alternation of problems for 9 more sessions before they switched to passive trust and abruptly reached their maximal level of trust during Session 11. During that session, they began passive trust in which one subject received the first half of the problems in the session followed by the other subject receiving half.

FR 4 GROUP

Fig. 2. Consecutive reinforcers and predominant and secondary method of distributing reinforcers to the other person for each session and for each member of a pair in the FR4 group. The maximum number of consecutive reinforcers in the session is indicated by an unconnected point if it is larger than the mean number (connected points). The dotted lines show when subjects switched from a predominantly inequitable method of distributing problems (competition and less than 80% correspondence of scores) to an equitable method with at least 80% correspondence of scores. The predominant (at least 25% of problems) and secondary (at least 5% of problems) method of distributing problems (i.e., share, give, competition, passive trust, and none) are indicated for each session above each graph. See the text for details.

FR 30 GROUP

Fig. 3. Consecutive reinforcers and predominant and secondary method of distributing reinforcers to the other person in the FR30 group. The maximum number of consecutive reinforcers in a session is indicated by an unconnected point if it is more than the mean (connected points). The dotted lines show when subjects switched from competition to an equitable method of distributing problems. The predominant and secondary methods of distributing problems are indicated for each session above each graph. The key for these methods is on Figure 2.

Once equitable solutions were reached in the FR30 group, the correspondence of scores averaged 93%. Subjects 7 and 8, who alternated by days, averaged only 85%, because of the different number of problems in sessions. Correspondence averaged only 43% during the 12 sessions of competition for this group.

Two aspects of the data for the FR60 group in Figure 4 are noteworthy. First, as with the FR30 group, subjects did not show trusting behavior at the start of the experiment, but all did show some trust before the first session had ended. This can be seen in the mean number of consecutive reinforcers for the first session: Subjects 50 and 51 averaged 1.8; Subjects 52 and 53 averaged 2.1; Subjects 9 and 10 averaged 2.2. Subjects 50 and 51 did not expand beyond alternation by two's until the ratio was increased to FR70 at Session 6 when they be-

gan alternating by blocks of 4 problems. The other two pairs showed a gradual expansion up to about 15 to 25 (Subjects 52 and 53) or 10 to 25 (Subjects 9 and 10) consecutive reinforcers. It will be recalled from the procedure section that Subjects 9 and 10 had run for 9 sessions before the data shown in Figure 4 (8 sessions at FR30 and 1 at FR60) but the questionnaire after Session 9 indicated they did not know the passive trust procedure was an option.

The second noteworthy aspect of these data is that once trusting behavior developed, it endured even when the fixed ratio was abruptly decreased from FR60 or FR70 to FR4, a ratio at which no subject had previously acquired trusting behavior (Figure 2). Trust endured at FR4 as long as the procedure was in effect (6 to 9 sessions) except for one

Fig. 4. Consecutive reinforcers and predominant and secondary method of distributing reinforcers to the other person for the group with FR60 followed by FR4. The points at which the ratio was changed are indicated along the X axis. The maximum number of consecutive reinforcers in a session is indicated by an unconnected point if the maximum was greater than the mean (connected points). The predominant and secondary methods of distributing problems are shown for each session above each graph. The key for these methods is on Figure 2. The graph for Subjects 9 and 10 starts with Session 10, because a questionnaire after Session 9 indicated the subjects did not know how to distribute problems by the passive trust procedure.

session when Subjects 52 and 53 competed. The audio monitoring revealed that the subjects discussed this change to competition. One subject was overheard to say "let's add some spice to this session since there are only 4 pulls". These subjects returned to their maximal levels of trust for the final six sessions.

The correspondence of scores was only 87% for Subjects 52 and 53, largely because Subject 52 had only 85% accuracy and was not reinforced on a sizeable portion of problems he worked. The other two pairs averaged well over 90% correspondence.

In this experiment trusting behavior has been measured in terms of the number of consecutive reinforcers two subjects allowed each other to obtain during sessions in which they distributed problems by a noncompetitive method and reached equity. Both subjects had to show trusting behavior (i.e., allow the other subject to receive several consecutive problems) for the pair to reach equity. This was seen in Figures 3 and 4. However, a measure of trusting behavior in terms of consecutive problems does not show whether a subject was

ahead or behind when trusting behavior was engaged in. One might argue that trusting behavior that only reduces the extent to which a subject is ahead is different from trusting behavior that results in a subject becoming further behind. These two types of trusting behavior would be evident within a session if Subject A allowed Subject B to work a block of, for example, 10 problems, and then for Subject A to work 10. If this alternation were repeated, Subject A would always be 0 to 10 behind and Subject B always 0 to 10 ahead. The top graph for each pair in Figure 5 shows which subject was the furthest behind in each session, by how much, and the maximum amount the other subject was behind. The bottom graph for each pair identifies the subject who was behind at the end of the session and the amount. Only the data from the seven pairs that showed expanded trusting behavior are presented in Figure 5. As in the example above, once trust expanded beyond the minimal level (an average of over 1.5 consecutive problems indicated by arrow), each session typically contained one subject who was be-

hind several reinforcers or problems (unfilled circle or triangle) and one subject who was never behind more than a problem or two (unfilled square). It was always the case that the subject that was the furthest behind during a session also spent the largest amount of the session behind. There was only one session during which subjects (Session 14 for Subjects 50 and 51) systematically alternated being ahead and behind within a single session.

It is important to note, however, that for all pairs each pair member was furthest behind for some sessions. For some pairs, this was alternated on a strict session-by-session basis (Subjects 13 and 14) or on a two-session basis (Subject 7 and 8), but usually the alternation was not that systematic.

The bottom graph for each pair shows that subjects ordinarily did come very close to equity by the end of the session. As would be expected for trusting behavior, the temporary deviations from equity within the session were larger than the deviation at the end of the session. Subjects 52 and 53 had the largest deviations at the end of the session, because they distributed problems on the basis of number worked rather than number correct and Subject 52 missed a number of problems. For Subjects 7 and 8, reinforcers behind at the end of the session is based on an average of four sessions because these subjects alternated problems by days or two-session blocks.

Audits. Audits decreased over sessions for most subjects, but the decrease tended to be larger and to reach lower levels for those subjects who trusted. The audit data of Table 1 are based on an average of one session of each duration (16, 20, and 24 min) except in a few cases where the experiment ended before a 3-session block had been completed and the data have been extrapolated to reflect the correct amount of time. Table 1 shows that the mean number of self, coactor, and interpersonal (self and coactor audits within 5 secs of each other) audits per session during the first 3 sessions for the 10 subjects of the FR4 group and Subjects 33 and 34 of the FR30 group who did not trust were 6.9, 6.5, and 5.2 respectively. These rates decreased to 5.3, 5.4, and 4.5 per session respectively during the last 3 sessions. For the remaining 14 subjects in the FR30 and FR60 groups who trusted, the mean rates of self, coactor, and interpersonal audits respectively for the first 3 sessions were 5.8, 4.8, and 2.9.

These rates decreased to 2.6, 2.1, and .6 by the last 3 sessions. Although initially lower, the rates of the subjects who trusted still showed a larger average decrease. The initial lower rates of the subjects who trusted may have also been due to the early development of trust, particularly in the FR60 group where trust developed in the first session and where 3 subjects had initial rates of 1 or less per session for all three types of audits.

DISCUSSION

Trust appears to differ from other equity phenomena such as cooperation and sharing in terms of the existence of inherent or natural contingencies within a two person social situation to produce trust. In this experiment and others (Hake et al., 1975a, 1975b; Olvera & Hake, 1976) response patterns changed from competition to either sharing or cooperation when no external contingency to do so had been arranged. Several of the natural contingencies that might produce equity were mentioned earlier: the potential aversiveness of inequity, the possibility of emotional or aggressive behavior, the threat of one person quitting, and the fact that competition naturally requires more work than sharing or cooperation. Trust, however, did not expand beyond the minimal levels of strict alternation in the FR4 group where only the natural contingencies of a two person social situation existed. Trust expanded beyond the minimal levels required for cooperation and sharing only when the experiment provided an external advantage in the form of less work for trusting behavior. The major reason an external contingency is necessary is that the natural contingencies of trusting behavior appear to produce aversive stimuli, because trust involves inequity which has been shown to be aversive (e.g., Marwell & Schmitt, 1975; Shimoff & Matthews, 1975). Some external advantage to trust seems necessary to override this natural aversive aspect of trust. However, this reasoning must be restricted to the acquisition of trusting behavior, because once acquired in the FR60 group, trusting behavior endured even when the ratio contingency that produced trust (FR60) was reduced to the ratio that would not produce it (FR4) (see also Matthews, 1977; Matthews & Shimoff, 1979). One obvious explanation is that the aversiveness of

TOP GRAPH

S MAXIMUM BEHIND - ○, △

OTHER S MAXIMUM BEHIND - □

BOTTOM GRAPH

S BEHIND AT END OF SESSION - ●, ▲

(NO SYMBOL IF EVEN)

Fig. 5. Maximum number of reinforcers behind during each session for each pair member (top graph) and for the pair member that was behind at the end of the session (bottom graph) for the seven pairs that showed expanded trust. The pair member that was farthest behind during the session is indicated in the top graph by the unfilled circle or triangle. The open square shows the maximum number of reinforcers the other pair member was behind during the session. The arrow on the top graph indicates the first session that pair members averaged over 1.5 consecutive reinforcers. Competition was the predominant method of reinforcer distribution in sessions before the dotted line. The bottom graph shows the pair member that was behind at the end of the session (filled circle or triangle). Absence of a symbol indicates the pair members were even at the end of the session. The last two points for Subjects 7 and 8 each represent 4 session blocks, because this pair reached equity by alternating days or 2-session blocks.

the inequity involved in trusting behavior is lowered once individuals each have a history in which their trusting behavior is reinforced

by trusting behavior by the other person (i.e., they have learned that the inequity is only temporary).

Table 1

Self, coactor, and interpersonal auditd for first and last 3 sessions for subjects who trusted and those who did not.

	<i>Self Audits</i>		<i>Coactor Audits</i>		<i>Interpersonal Audits</i>	
	<i>First 3</i>	<i>Last 3</i>	<i>First 3</i>	<i>Last 3</i>	<i>First 3</i>	<i>Last 3</i>
Subjects Who Trusted						
S-7	9.7	.3	6.7	1.7	4.7	.0
S-8	2.3	2.0	3.7	.0	1.0	.3
S-15	11.3	7.0	10.0	3.7	8.0	1.0
S-16	5.3	5.7	3.3	4.3	2.3	.0
S-13	14.3	3.7	13.0	2.7	7.3	2.0
S-14	7.3	2.0	5.7	2.7	4.0	.7
S-3	8.7	2.9	9.3	3.2	6.0	1.4
S-4	2.7	6.1	.7	4.0	.3	2.9
S-9	6.3	4.3	3.5	3.0	.9	.0
S-10	6.3	2.0	4.7	2.7	2.2	.7
S-50	.0	.0	.0	.0	.0	.0
S-51	.3	.0	.0	.0	.0	.0
S-52	.7	.0	1.0	.0	.0	.0
S-53	5.7	1.0	5.7	.7	3.7	.0
Mean	5.8	2.6	4.8	2.1	2.9	.6
Subjects who didn't trust						
S-27	6.3	3.0	8.3	2.0	3.7	2.0
S-28	6.7	4.3	4.0	3.3	3.3	3.0
S-31	10.0	4.0	6.3	5.0	6.3	5.0
S-32	2.3	5.3	1.0	5.0	.7	3.7
S-25	9.0	1.2	9.0	.8	9.0	.8
S-26	.7	.8	.3	.8	.3	.8
S-21	14.7	21.0	15.0	24.3	14.7	19.6
S-22	12.7	10.3	15.3	10.7	10.0	9.3
S-23	9.7	7.3	9.0	7.7	4.7	7.3
S-24	.7	1.7	.0	1.3	.0	.7
S-33	6.3	4.0	6.3	2.7	6.3	1.3
S-34	4.0	1.0	3.3	.7	3.3	1.0
Mean	6.9	5.3	6.5	5.4	5.2	4.5

Pair members who trusted in the present experiment alternated sessions in which they were behind. This pattern of trusting behavior differed somewhat from that observed in Matthews (1977) and particularly Matthews and Shimoff (1979) where each pair member was usually behind during a sizeable portion of each session. For example, in Matthews and Shimoff (1979), Subject A who was ahead by 10 reinforcers allowed Subject B to obtain reinforcers not only until Subject B was even, but also until Subject B was ahead by 10. At this point, Subject B would allow Subject A to go from 10 behind to 10 ahead. In their experiments, however, there was a punishment contingency (loss of points) for any alternation of which subject received the reinforcer. Hence, going through the zero or equity point, which avoided point loss and resulted in each subject being behind a portion of a single session, may have resulted from the punish-

ment contingency rather than as a characteristic of trusting behavior. In the present experiment there was no explicit punishment contingency for alternating which subject received reinforcers. The subjects did alternate who was farthest behind, but they did it over sessions, and being behind was typically alternated in a nonsystematic manner that did not involve strict alternation of sessions. These observations seem consistent with other findings which suggest that once trusting behavior develops between two persons, the aversiveness of the temporary inequity involved in trusting behavior decreases, (e.g., trusting can be maintained with contingencies that would not initially produce it, less auditing by subjects who trusted). These findings also raise questions about the definition of trusting behavior. In the present experiment, trusting behavior was defined as allowing a partner to obtain consecutive reinforcers as long as the pair reached

equity through a noncompetitive method of distributing reinforcers. Simply, the designation of trusting behavior was not restricted to instances in which the subject was behind and allowed the partner to obtain reinforcers as was the case in Matthews and Shimoff (1979). There are arguments for both definitions. Consider the present definition which does not require a subject to be behind to show trusting behavior as long as equity is eventually reached by a noncompetitive method. First, human research has shown inequity to be aversive regardless of whether it is the subject or the partner who is behind (Marwell & Schmitt, 1975; Shimoff & Matthews, 1975). And, as long as equity is reached, what difference does it make who is temporarily ahead or behind? This indifference seems to be reflected in the subjects' behavior once trust is acquired: subjects don't systematically alternate who is behind; both are typically not equally behind in a single session (Figure 5); they continue trusting behavior even when the contingency is removed; and they make fewer audits. From the other point of view, the fact remains that subjects do alternate who is behind. At this point, perhaps both response patterns should be labelled as trusting behavior, but they should be differentiated in terms of degree of trust with trusting-when-behind as a higher level of trust than trusting-when-ahead.

Trusting behavior would be expected to expand gradually as subjects learned the inequity was only temporary. Of the seven pairs that trusted in the present experiment, this was clearly the case for four pairs and clearly not the case for two pairs in the FR30 group (Subjects 7 and 8; Subjects 13 and 14) who expanded abruptly rather than gradually to their maximal level. An explanation of the expansion or acquisition of trust in terms of a history of reinforcement for actual trusting between the two subjects may need to be supplemented in the present experiment by additional communication factors that could affect trusting behavior. The present procedure was a social one that allowed communication between the subjects, and several previous experiments with the Prisoner's Dilemma Game have shown large differences in cooperation between communication and no communication conditions (e.g., Wichman, 1970; see review by Nemeth, 1970). First, each subject had an individual history of trust negotiations

prior to the experiment in which verbal stimuli represented different levels of negotiated trust for himself and other persons. Second, each subject also had an individual history of probabilities of reinforcement, associated with his own and the other persons' verbal stimuli (e.g., another person agreed to trust and did). This is to suggest that for some subjects the combination of minimal trust (cooperation or sharing), a contingency to trust, and verbal negotiations may be sufficient for abrupt expansion from minimal trust. Simply, after minimal trust has developed, verbal responses may be used as a short cut for an actual history of trusting behavior between the two persons. Subjects were overheard to discuss methods and patterns of distributing problems prior to reaching equity and trusting behavior. It seems likely that part of the process by which subjects reached equity and expanded trust in the present experiment was through unmeasured verbal behavior. Precise measurement of the verbal negotiation will be difficult, but it may be necessary if we are to observe and study the complete process involved in the acquisition of equity and trust in social procedures. However, it should also be pointed out here that communication is not essential for the acquisition of trusting behavior or for the occasional abrupt expansion of trust, because both were observed in Matthews and Shimoff (1979) where subjects were in individual sound-attenuating chambers, could not communicate, and were prevented from learning the identity of their partner.

Although two pairs in the present experiment showed abrupt expansion of trust, no pair trusted from the start of the experiment. In the FR30 group, trust did not consistently expand beyond 1.5 consecutive problems until Session 2 (Subjects 7 and 8), Session 4 (Subjects 15 and 16), or Session 11 (Subjects 13 and 14 and Subjects 3 and 4). This differs from the nearly immediate acquisition that occurs under instructional control. Trust developed faster in the FR60 group, but even there trust did not reach 1.5 consecutive problems until the last half of session 1. Several factors were important in achieving contingency as opposed to instructional control. First, there were options that did not require trust (e.g., sharing, cooperation), one option that did not require equity (competition), and there was no extra monetary reinforcement for trusting. In this

way, the options themselves did not suggest trust. Second, the contingency to trust did not punish nontrust with loss of reinforcement. Punishment of not trusting could have suggested to the subjects that not trusting was the wrong response and thereby indirectly instructed them to trust. Third, the group design did not include changes in conditions which in themselves might provide subtle instructions that the subjects should also change their behavior. We are raising the possibility that in human research any change in contingencies, not simply changes to punishment, might confound control via experimental contingencies and control via instructions. Finally, the FR30 response requirement was a moderate one that in previous research (Olvera & Hake, 1976) had produced a switch from competition to sharing (also less work) in only two of three subjects after 11 to 12 sessions. The contingency was not strong enough to be "obviously correct."

Passive trust was preferred over active trust. Only one pair engaged in active trust and this was after they had initially trusted for several sessions through the passive procedure. The lack of anything else to do in the chamber may have been responsible for the switch to active trust by these subjects, because they had an initial long history of competition in which both responded and the switch to the passive procedure essentially left them with nothing to do. A major factor in the preference for passive trust by other subjects was that it was easier (i.e., no responses vs. 30 or 60 responses). The passive trust procedure has been described here as an external contingency to trust, because the passive or nonresponding aspect is not crucial to the definition of trust. However, passive trust is certainly one way to trust and may well be as natural and common as active trust procedures.

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APPENDIX

Instructions:

1. The panels in front of you can be used to obtain and to work problems for points that you can exchange for money. All problems will be worth 5¢.

When a session is over, you may have earned more money, less money, or the same amount of money as the other person

depending upon how many problems you each worked correctly.

On each trial, you may decide to either respond on these levers (distribution levers) to distribute the problem or you may decide not to respond to distribute the problem. If you do not respond, the person who worked the last problem will also be able to work the next one. If you both respond

to distribute a problem, the first one who completes the required number of pulls on the plunger determines who gets to work the problem. Both of you can respond or only one of you can respond, or neither of you can respond. Any way is o.k. Regardless of what you do, each trial or problem will last for 25 seconds. The following instructions will tell you what happens during a trial, how to respond to distribute problems, how not to respond to leave the distribution the way it is, and how to work the problems.

2. Look at the large panel. At the beginning of each problem the large light (magnitude-of-reinforcement stimulus) in the center of the panel will come on and the number five will appear there. This means the problem is worth 5¢. Shortly after this light goes on, one of the colored lights (distribution lights) in the upper left corner of your panel will also be illuminated. The color of the light that comes on (distribution light) indicates who worked the last problem and who gets to work this problem if you decide not to respond. If you decide not to respond, and if the light is brown, the person at the brown panel will get to work the problem. If you decide not to respond, and if the light is green, the person at the green panel will get to work the problem.
 3. Before you can work the problem both of the lights will come on to allow you time to distribute the problems if you wish. If you decide not to respond to distribute the problem just wait until one of the lights goes off and the person's light that remains on (the same one that was on earlier in the trial) will be able to work the problem. When both of the lights are on you can respond to distribute the problem by pulling one of the levers on the left side of the apparatus (distribution levers). If you pull the top plunger enough times, you can take the problem for yourself. If you pull the bottom plunger enough times, you can give the problem to the other person. If you are at the brown apparatus and the brown light remains on, that means that you have the problem and can work it for points. If you are at the green apparatus and the green light remains on, that means the person at the green apparatus can work and receive credit for the problem.
- Be sure that you pull the plunger all the way out: each time you pull the plunger, the small light (feedback stimulus) will flash. When the other person responds to take the problem, each response will produce a flash here (response feedback, coactor responses). When the other person responds to give the problem to you, each response will produce a flash here (response feedback, coactor responses).
4. If you both respond to distribute a problem, the first one who completes the required number of pulls on the plunger determines who gets to work the problem. Both of you can respond or only one of you can respond, or neither of you can respond. Any way is o.k. Regardless of what you do, each trial or problem will last for 25 seconds.
 5. If you receive the problem, the light (sample operative stimulus) on top of the small stand (sample panel) will light up. When this happens, you can push the button (sample producing button) on the stand and a series of letters will appear like T, K, and V (sample stimulus). Your task is to match these letters by pressing the same letters on your panel (matching response buttons). You must finish all of the responses necessary to distribute the problem and match the correct letters before the light (sample operative stimulus) goes out if you are to receive credit for a problem.
 6. You may not move your panels, stands, or chairs. If you do, or if you talk without pressing the conference button, it could result in your not being able to work problems for 1 minute. The conference button is located in the center of the large apparatus. Hold it down the entire time you talk with the other person.
 7. On the right side of the large apparatus are two small mirrors (self and other person audit counters). By pushing the small button next to the top mirror five times you will be able to see how many points you have earned. Pushing the button next to the other mirror will tell how many points the other person has earned.
 8. Other than these restrictions, you can work problems any way you want.
 9. We will tell you when the session is completed.