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THE DESIGN AND EVALUATION OF A WORKSHARING SYSTEM FOR EXPERIMENTAL GROUP LIVING[1]

RICHARD FEALLOCK[2] AND L. KEITH MILLER

UNIVERSITY OF KANSAS

Failure to share household chores equitably may be a major cause of the high failure rate of experimental group-living arrangements. A behavioral approach to worksharing based on a point system was implemented in one experimental group and its most important components experimentally evaluated. Experiment I showed that awarding credits produced more work than not awarding credits. Experiment II showed that making credits contingent on the outcome of a detailed inspection produced more work than awarding credits noncontingently. Experiment III demonstrated that awarding rent reductions contingent on credit earnings produced more work than awarding rent reductions noncontingently. Other evaluative data suggest that the resulting living arrangement is cheaper, more effective, and more satisfactory to the residents when compared to the most popular alternative living arrangements.

DESCRIPTORS: behavioral engineering, commune, group living, money reinforcers, point economy, peer reporting, work sharing, consumer satisfaction, adults

Experimental living arrangements have been a widespread phenomenon throughout history. Proposals for the ideal living arrangement have spanned the history of western civilization from Plato's *Republic* to Skinner's *Walden Two* (1948). Practical attempts to create the ideal living arrangement began when well-known philosophers drew up the constitutions for many of the ancient city-states (Morgan, 1957). Extensive efforts to create the ideal community occurred in nineteenth-century America, when at least 130 utopian communities were founded (Nordhoff, 1875). More recently, thousands of "communes" have appeared since 1964 (Haughey, 1971; Jones, 1973; Otto, 1971; Walker, 1971), and a recent poll revealed that 40% of college students expressed a desire to live in a commune (Velie, 1973).

A major problem that any experimental living arrangement must confront is that of sharing the basic work of the community. Informal accounts suggest that contemporary communes experience a breakdown in the basic housework required by the group (*e.g.,* Kanter, 1970; Lanes, 1971), perhaps becoming a major factor in the almost universal failure of such experiments within a year or two (*e.g.,* Gardner, 1973; Hedgepeth, 1971; Speck, 1972). An analysis of experimental living from the perspective of operant psychology (Miller, 1975) suggests that the rate of doing housework would decrease over time unless appropriate contingencies were implemented. Such a decrease would mean that the group would not provide its members with such potentially powerful reinforcers as a clean and neat living environment, well-prepared meals, and clean plates and silverware.

Furthermore, the withdrawal of such reinforcers could lead to an increase in aggressive interpersonal behaviors (Azrin, Hutchinson, and

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[2]Now at the Dr. John MacKinnon Hospital, Owen Sound, Ontario, Canada.

Hake, 1966; Kelly and Hake, 1970). It seems safe to assert that getting the basic housework done is an important social problem for any experimental living arrangement.

The present paper describes a behavioral system designed to create and maintain an equal sharing of work in an experimental living arrangement. The system has four components. First, the basic housework is specified in terms of about 100 simple jobs. Second, the members volunteer for the jobs of their choice and are then held accountable through a group-managed inspection system. Third, the performance of the jobs is consequated by a credit system similar to that used in other point economies (*e.g.,* Phillips, 1968). Fourth, the credits are backed up by contingent reductions in the rent charged to residents. This technological package will be referred to as the "Worksharing System".

Three experiments in which we analyzed three of the four components of the Worksharing System are reported. The first examined the importance of awarding credits for worksharing behaviors. The second examined the importance of inspecting the performance of worksharing jobs and awarding credits contingent on the inspection. The third examined the importance of backing the credit system with contingent rent reductions. Taken together, these experiments examine the functionality of the Worksharing System for maintaining household work within an experimental living arrangement.

GENERAL METHOD

Subjects and Setting

The experiments were conducted at the Center for Intentional Living, a co-ed living arrangement for up to 30 students attending the University of Kansas. Fifty-seven undergraduates and nine graduate students, representing a broad sampling of the student body with no observed demographic or personality differences, participated over a 24-month period. The average age of the students was 21 yr, and their majors ranged from Chinese to chemical engineering.

The setting for the experiment was a large frame house near the campus of the University of Kansas. Twenty-eight rooms were available for occupancy by individual residents. In addition, residents shared a lounge, dining and meeting room, snack kitchen, institutional kitchen, shop, and bathrooms. All cleaning behaviors occurred within the public areas.

Worksharing System

The common work of the residents was organized by means of a "worksharing system", consisting of four parts: the jobs, job specifications, inspections, and a credit system.

About 100 weekly jobs were selected, aimed at keeping the public areas of the house clean, keeping the members fed a daily evening meal, and keeping the physical structure in good repair. A list of these jobs was posted each Thursday. Members signed up for jobs for the following week on this list.

Each job was specified in terms of the desired outcomes associated with that job. The number of outcomes ranged from as few as four (for cleaning the showers) to as many as 102 (for cleaning the first-floor washrooms). Outcomes were selected that represented relatively enduring physical changes in the environment (Ayllon and Azrin, 1968) to facilitate inspection at a later time.

The outcomes associated with each job were inspected by a trained house member once a day between 8 and 9 p.m. The inspector indicated "pass" or "fail" on a checklist that listed all of the outcomes specified for each job. The inspection took about 30 min. The inspection was a contract job for which the member received credits.

Inspectors were trained by having a previously trained inspector go around with them and point out where and how to inspect. After the first session, the trainer and the trainee inspected each outcome independently and compared results. Each disagreement was discussed and resolved. By the third session, the trainer and trainee inspected the entire house independently

and then computed both total reliability and fail reliability. "Total reliability" was defined as the number of agreements on checklist items divided by the total number of checklist items. "Fail reliability" was defined as the number of checklist items that trainer and trainee both agreed were fails, divided by the total number of items that either inspector failed. This latter reliability was computed because it eliminated the high probability of random agreement that occurs when two inspectors pass a high proportion of the items; it is therefore a more stringent test of reliability. If total reliability was 90% and the fail reliability was 75% or more, the trainee was considered trained. If a lower reliability was attained, the process was repeated until the criterion reliability had been obtained.

Credit values were assigned to each job and any resident signing up for and satisfactorily completing a job was awarded those credits. The credit values were determined by timing the jobs during the first two weeks of implementing the system and credits were assigned at the rate of 15 per hour. Then, the values were adjusted for "popularity" by decreasing the values of the first five jobs selected during the sign-up period and increasing the values of the last five jobs selected. For the last 2 yr, the value of any job can be adjusted by majority vote of the members if all increases in one job are balanced by decreases in one or more other jobs (thereby eliminating inflation).

Members signing up for and doing a specific job were awarded the full credits assigned to that job if 90% or more of the outcomes associated with that job were passed by the inspector. They received proportional credit if more than 50% of the outcomes were passed. They received no credits if less than 50% of the outcomes were passed, and also were fined $2.00. (All fines were collected by the treasurer and used for the general operating expenses of the house.)

Any members who earned 100 or more credits each week for a month received a $40 rent reduction from next month's rent. For every credit below 100 that they earned, they received 10¢ less from their rent reduction. The average rent before rent reduction was $85. Most members earned the full reduction, so that they paid an average of $45 rent per month. This amount was sufficient to pay all expenses including mortgage, taxes, and insurance.

Information about credits earned was posted in a public place for each member once a week.

The house was completely self-governing. A member's Handbook outlined the rules of the house, including a set of rules for changing rules (such as the definition of a quorum, vote required for change, *etc.*). All experiments were explained to the group members and permission requested for conducting them. A more complete description of the entire system is available (Miller and Feallock, 1975).

Response Definition for Cleaning Behaviors

The experiments reported were restricted to the cleaning behaviors. Cleaning behaviors were defined by a total of 25 jobs that were awarded credits totalling between 20% and 25% of the total credit economy. Table 1 lists the 25 jobs, the number of outcomes associated with each job, and the credit value of the jobs.

The outcomes associated with each job were inspected each day according to a detailed checklist. Table 2 shows the checklist used to inspect the job of vacuuming and mopping the lounge. A second, independent inspection was conducted approximately once a week by a trained inspector as part of the normal routine of the house (to determine if the regular inspector was doing a careful job). A minimum of two determinations of reliability were obtained in this way during each experimental condition. Total reliability averaged 95% (with a range from 81% to 100%) and the fail reliability averaged 74% (with a range from 33% to 100%).

EXPERIMENT I

One question asked by members about the worksharing system was whether members had

Table 1

Household Work Jobs

Jobs	*Days*	*No. of Outcomes*	*Credits*
Clean outside area	MWF	30	15
Vacuum and mop lounge	M	20	20
Mop first floor	M	20	20
Clean first-floor washrooms	MTW	102	20
Mop second-floor halls, north	M	11	15
Mop second-floor halls, south	M	15	15
Clean second-floor washrooms	MTW	75	20
Mop third-floor halls	M	10	15
Clean third-floor washrooms	MTW	24	15
Vacuum and sweep lounge	T	11	10
Vacuum and sweep lounge	W	16	15
Sweep first-floor halls	W	20	20
Sweep second-floor halls, north	W	7	10
Sweep second-floor halls, south	W	11	10
Vacuum and sweep lounge	R	11	10
Sweep third-floor halls	W&F	14	15
Clean ping-pong room	R	6	15
Clean showers	T&F	4	20
Clean first-floor washrooms	RFS	102	20
Clean second-floor washrooms	RFS	75	20
Vacuum and mop lounge	F	20	20
Mop first-floor halls	F	27	20
Mop second-floor halls, north	F	11	15
Mop second-floor halls, south	F	15	15
Vacuum and sweep lounge	S	11	10

Table 2

Example of an Inspection Checklist

M	
	Lounge
☐	a. Pick up trash
☐	b. Sweep up dirt
☐	c. Vacuum and shake out rugs
☐	d. Empty out and clean ash trays
☐	e. Empty trashbasket, replace liner
☐	f. Mop tile
☐	g. Return items to proper place
☐	h. Pick up trash in telephone room
☐	i. Sweep up dirt in telephone room
☐	j. Mop floor in telephone room
☐	k. Provide clean paper and pen at phone
☐	l. Return items to proper place from phone room
☐	m. Replace burned out bulbs
	Center Stairs
☐	a. Pick up trash
☐	b. Sweep up dirt
☐	c. Pick up trash—lower left
☐	d. Sweep up dirt—lower left
☐	e. Mop stairs
☐	f. Mop lower left
☐	g. Replace burned out bulbs

to be awarded credits at all. Many members felt that the reinforcement intrinsic to having a clean and neat house would be sufficient to motivate themselves to do the cleaning. To investigate this possibility, all credits that were used for cleaning jobs were transferred to jobs involved in painting the outside of the house. Cleaning performance during that condition was compared with cleaning performance when the normal system was in effect.

Experimental Design

Cleaning performance was investigated when credits were awarded for cleaning jobs, when they were not, and when they were reintroduced. Three conditions were investigated:

1. *Credits for cleaning:* during this condition, the normal worksharing system was in effect; in particular, credits were awarded for cleaning jobs satisfactorily completed. This condition lasted for 24 days.

2. *No credits for cleaning:* during this condition, credits were no longer posted or awarded for any cleaning jobs. All available cleaning credits were awarded to members for completing outside painting. This condition was terminated at the demand of the members after 18 days.

3. *Credits for cleaning:* during this condition, the normal worksharing system was again implemented in a reversal to the first condition. This condition lasted 39 days.

Thus, a simple reversal design was used in this experiment.

Results and Discussion

Figure 1 shows the effect of not awarding credits on the percentage of cleaning outcomes that were passed. During the initial condition when credits were awarded for cleaning jobs, 96% of the outcomes were passed. When credits were not awarded for cleaning jobs, this fell to a mean of 60% with a strong downward trend reaching as low as 33%. When the credits were again awarded for cleaning jobs, 93% of the outcomes were passed. Thus, considerably more cleaning was done by the group as a whole when credits were contingent on cleaning.

During these conditions, the per cent of posted painting jobs completed was 3% with no credits, 99% with credits, and 0% without credits.

An examination of the individual data reveals a similar pattern to the group data. Of six members who chose cleaning jobs throughout the experiment, all showed higher rates of cleaning during the first condition than when credits were not awarded for cleaning, and five of the six showed a subsequent higher rate of cleaning during the reversal condition.

This experiment shows that members of the Experimental Living Project did more cleaning (and painting) when they were awarded credits than when they were not. The fact that they demanded the re-instatement of the credits also suggests that the membership understood this relationship and found it acceptable. It can be concluded that the awarding of credits is functional for maintaining cleaning behaviors.

EXPERIMENT II

One question raised early by house members about the worksharing system was whether it was necessary to award credits contingent on the outcome of the inspections. Some members suggested that it would be nicer if there could be "trust" in the house, so that members who agreed to do a job would not have to have their work inspected and credits awarded on the basis of that inspection. An experiment was designed in which the amount of cleaning was compared when credits were contingent on inspection and when credits were awarded when a member signed up for, and thereby agreed to do a job.

Experimental Design

Cleaning outcomes were observed when credits were contingent and when they were not.

1. *Credits contingent on inspection:* during this condition, the normal worksharing system was in effect. In particular, members were awarded credits for cleaning jobs contingent on the percentage of outcomes for those jobs that were passed by the inspector. This condition lasted 36 days.

2. *Credits not contingent on inspection:* during this condition, the normal worksharing system was changed in one way—the full credits for all cleaning jobs were awarded to members for signing up for the job, regardless of the outcome of the inspection. This condition lasted for 35 days.

3. *Credits contingent on inspection:* this condition was a reversal to the first condition. Again, the normal worksharing system was in effect, with credits awarded contingent on the outcome of the inspections. This condition was in effect for 25 days.

Thus, a simple reversal design was employed in this experiment.

Results and Discussion

Figure 2 shows the effect of contingent credits on the cleaning behavior of the members. When the credits were contingent on the inspection, 96% of all cleaning outcomes were passed. When credits were awarded noncontingent on the inspections, an average of 77% of all outcomes were passed. This average included a strong downward trend, with the last five points

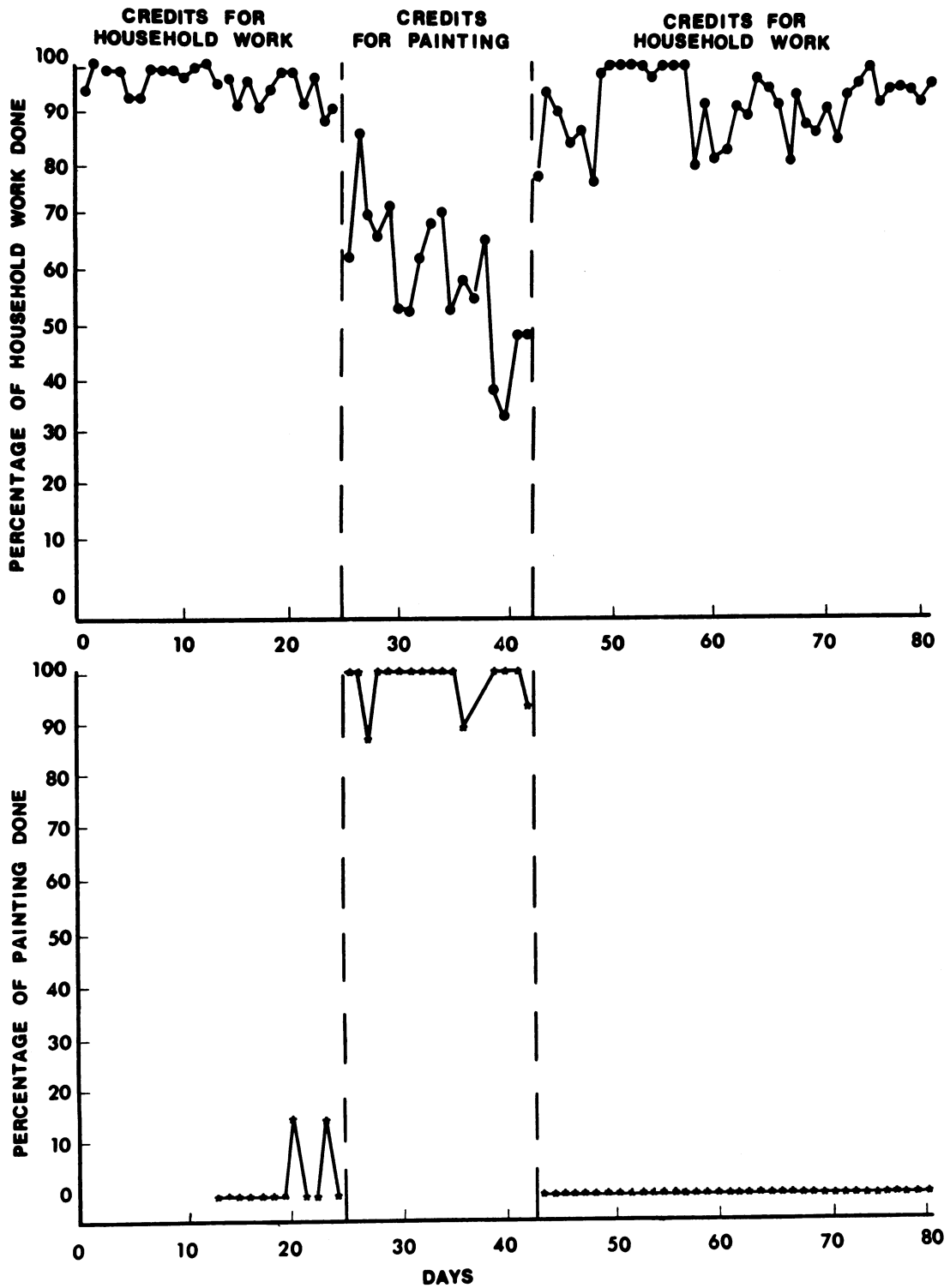

Fig. 1. The per cent of household work done under differing conditions of credit payment.

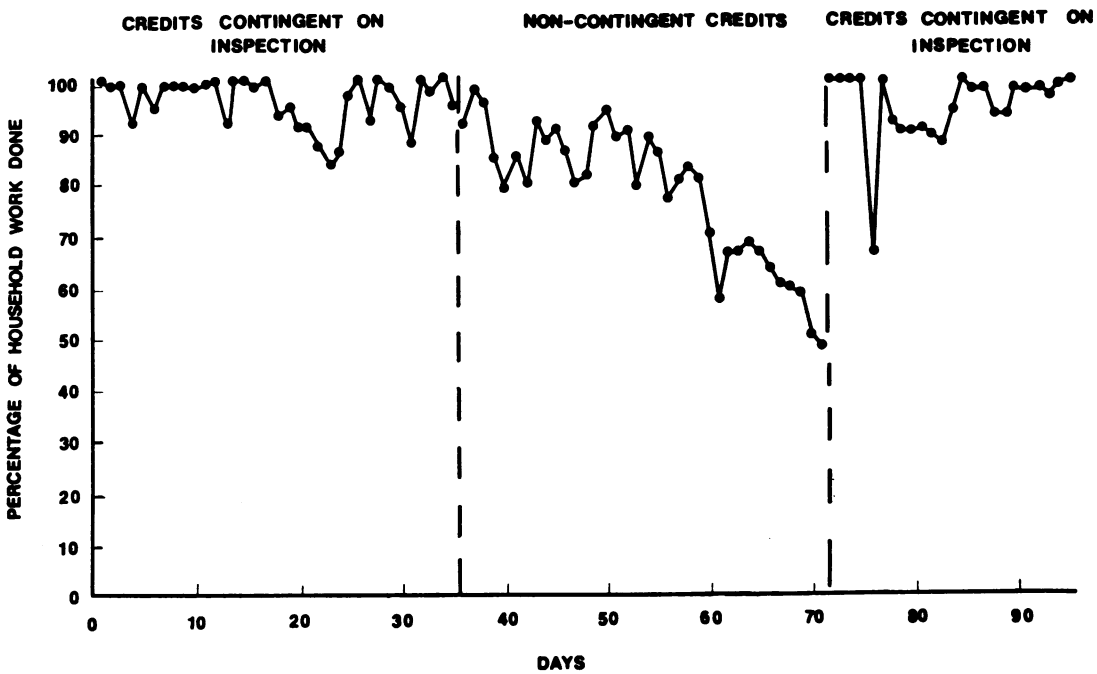

Fig. 2. The per cent of household work completed when credits were either contingent on inspection of the work done, or simply given for signing up for the job (noncontingent credits).

below 60%. When the condition was reversed to awarding credits contingent on inspections again, an average of 95% of all cleaning outcomes were passed.

An examination of the individual data revealed a similar pattern to the group data. Of 11 members who chose cleaning jobs during the first and second conditions, all showed a decrease during the noncontingent credits condition. Of five members who chose cleaning jobs during the second and third conditions, all showed an increase during the contingent credits condition. Of these 16 comparisons, 13 members showed a change of at least 10% in percentage of outcomes passed.

These data indicate that members satisfactorily completed more cleaning work when credits were awarded contingent on the inspections of their jobs. This indicates that the inspection system is a functional part of the worksharing system.

EXPERIMENT III

The first experiment indicated that awarding credits is functional in maintaining household cleaning. The second experiment showed that it is functional to award credits contingent on the outcome of detailed inspections of that cleaning. These two experiments leave open the question of whether the use of rent reductions as a back-up for the credit system is a critical aspect of the worksharing system. It is possible that the awarding of credits contingent on cleaning performance is sufficient to maintain the behavior. One could speculate that the credits might provide an objective form of feedback for each member and that they might therefore serve as reinforcers. Or one might speculate that the routine procedure of posting the credit earnings and running balance of each member in a public place might be associated with social consequences between members of the group sufficient to maintain cleaning behavior. If either speculation is correct, then the use of rent reductions to back-up the credit system is an unnecessary component of the system. The third experiment was conducted to determine the functionality of the rent-reduction procedure.

Experimental Design

Cleaning performance was investigated when rent reductions were awarded contingent on earning 100 credits per week, when they were given noncontingently, and when they were again awarded contingently. Three conditions were investigated:

1. *Contingent rent reduction:* during this condition, the $40 rent reduction was awarded only to those members who earned 100 credits per week for each month and maintained a minimum inspection of 50% for each job. This condition lasted 23 weeks.

2. *Noncontingent rent reduction:* during this condition, the $40 rent reduction was awarded to all members whether or not they earned the full 100 credits per week or maintained a minimum inspection of 50% per job. This condition lasted 17 weeks.

3. *Contingent rent reduction:* during this condition, the $40 rent reduction was awarded only to those members who earned the 100 credits per week and maintained a minimum inspection of 50% for each job. This condition lasted 19 weeks.

Thus, a simple reversal design was used.

Results and Discussion

Figure 3 shows the effect of the rent reduction on cleaning behavior. During baseline, when

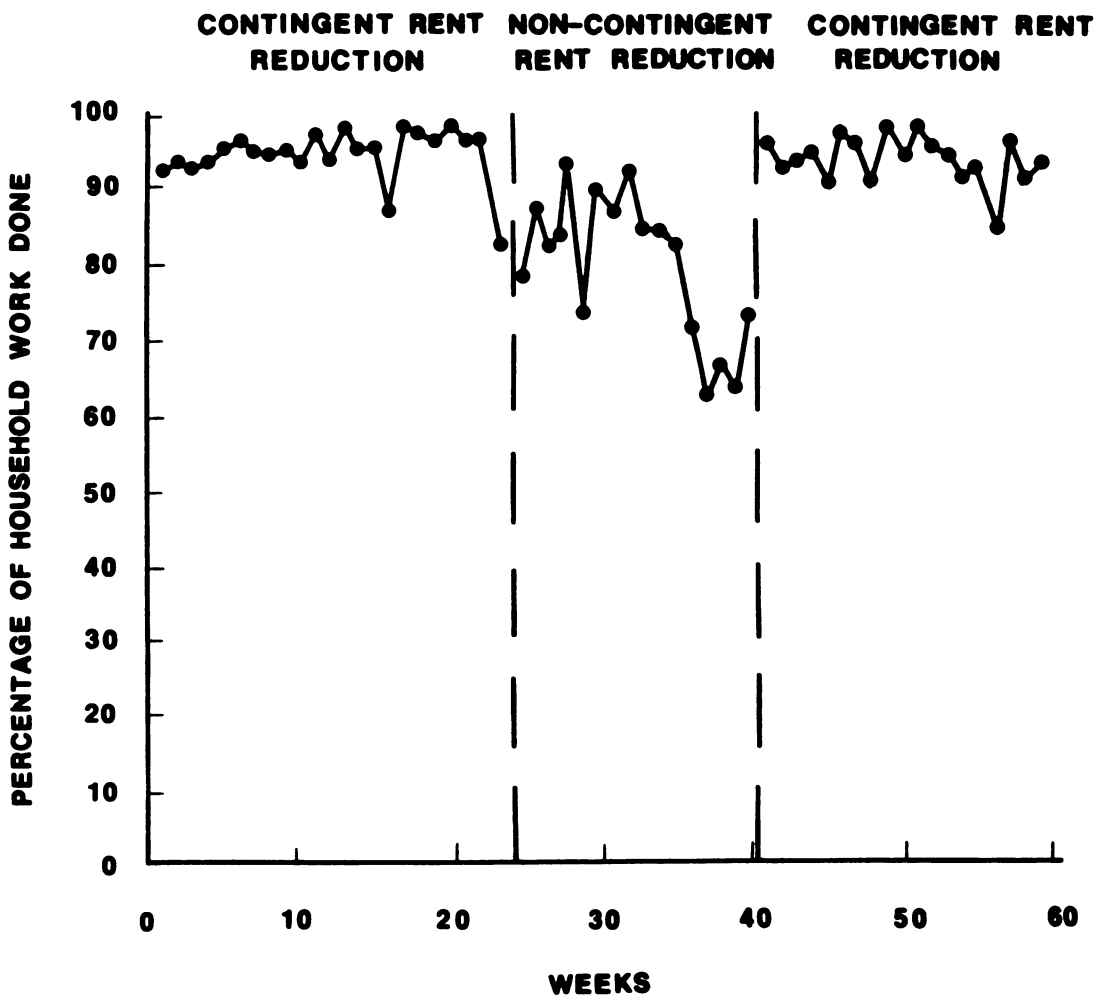

Fig. 3. The per cent of household work done under conditions of contingent and noncontingent rent reductions.

rent reductions were contingent on earning 100 credits per week, 94% of the outcomes were passed. When rent reductions were not contingent on earning 100 credits per week, the per cent of outcomes judged as "passed" gradually decreased until an average of only 67% were passed during the last four weeks of the condition. When the condition was reversed to contingent rent reductions, the cleaning performance again increased to 94% of the outcomes passed. Thus, for the group as a whole, the per cent of passed jobs was considerably higher with contingent rent reductions.

The data for individual members reveals a similar pattern. Of nine members present throughout the experiment, eight showed a decrease in rate when the noncontingent rent reduction was introduced, and all nine showed an increase when the rent reduction was again made contingent. Of 12 individuals who were present during only two of the three conditions, 10 showed a lower rate of work during the noncontingent rent-reduction conditions. Thus, the per cent of passed items was lower during the noncontingent rent reduction condition in 27 of 30 individual cases. Thus, we can conclude that both the group and the individual members showed a systematic decrease in cleaning performance when the rent reduction was made noncontingent.

GENERAL DISCUSSION

This paper has reported a behaviorally designed worksharing system for group living. Three experiments were conducted to evaluate the functionality of major components of that worksharing system. They demonstrated that the performance of cleaning jobs was higher when credits were awarded for cleaning jobs, when the credits were made contingent on detailed inspections of the work, and when the credits were backed-up by contingent rent reductions.

These experiments have demonstrated that the major characteristics of the Worksharing System are functional in maintaining household cleaning behavior. However, the results have only limited meaning out of the broader context of the Experimental Living Project and commonly available alternative living arrangements. For example, it has been argued that in addition to a functional analysis of applied behavioral systems, it is necessary to evaluate such factors as the relative effectiveness of the system compared to alternatives, the relative costs of the system, and the relative level of satisfaction expressed by the members in the system (Miller and Lies, 1974; Fixsen, Phillips, Phillips, and Wolf, *in press*). Clearly, even if the system is very functional, it will not be used if other systems are more effective, cheaper, or more satisfying.

While no formal evaluation of the Experimental Living Project with respect to these dimensions has been undertaken, some relevant information does exist. First, 20 members of the house who had previously lived in a dormitory were asked to provide a comparative rating of the food, cleanliness, and repairs. They reported the food to be much better and both cleanliness and repairs to be comparable between the Project and the dormitories (Miller and Feallock, 1975). This suggests that the Worksharing System compares favorably with the effectiveness of the system used in dormitories. Second, the cost of space in the Project was found to be 55% of the cost of living in a dormitory and less than apartment living (Miller, Lies, Peterson, and Feallock, 1976). If the cost of food is included, the comparison is even more favorable. Third, subjective measures of satisfaction by members of the Experimental Living Project compared to dorm living indicate a much higher level of satisfaction with the Project (Miller and Feallock, 1975). In summary, informal data suggest that at least one living arrangement that incorporates the Worksharing System compares very favorably in terms of effectiveness, cost, and satisfaction to available alternative living arrangements.

The use of a point economy in this experiment extends that technology beyond the ap-

plications to closed, nondemocratic, institutionalized settings where it was initially developed (Ayllon and Azrin, 1968). The present setting involved mature, legally competent adults in a setting that they can vote to change or that they can voluntarily leave at any time. These novel features of the setting required the solution of several problems not encountered in typical applications of point economies.

First, it was necessary to design a point economy that was responsive to the democratic control of the members. When the system was first designed and implemented, it was conceived of as a simple replication of previous point economies, and therefore no mechanism for democratic control was built into it. However, within several weeks, the residents strongly questioned this policy and demanded democratic control of the system. This demand was met by writing a Handbook containing the basic rules of the system and a set of rules for changing them. Residents agreed in writing to abide by the rules contained in the Handbook. Thus, the Handbook served not only as an initial behavioral contract specifying a behavioral system, but it also provided the residents with a democratic method for changing that system. Control was thus formally vested in the members.

Second, it was necessary to create a system in which the functional contingencies would not be gradually voted out. One part of the solution to this problem was carefully to state rationales for all rules contained in the Handbook, so that members would be aware of the reasons for having them. By requiring all members to read and pass a quiz over the rationales it was ensured that all residents were familiar with them. A second part of the solution was to design a programmed, self-instructional textbook capable of teaching residents the basic principles of behavior analysis in such a way that they would generalize to their own living environment (Miller, 1975). Research has demonstrated that this textbook produces such concept formation (Miller and Weaver, 1976). By teaching both the specific rationales and the general principles underlying the point system, it was hoped that the contingencies specified by it would not be voted out. In fact, in 3.5 yr of operation, no major contingencies have been voted out and many additional ones have been voted in.

Third, it was necessary to discover a consequence that was appropriate to a voluntary, self-funded setting. The consequences used in other settings frequently involve either special reinforcers that can be purchased only because of outside funding or reinforcers that are commonly available in the setting but have been restricted. Purchased reinforcers could not be used because the Experimental Living Project seeks to develop a viable, self-funded alternative living arrangement. Restricted access to commonly available reinforcers that one might find in group-living environments were not used either. It was felt that such restrictions would reduce the overall desirability of living there. Furthermore, both types of reinforcers have only an arbitrary relationship with the behaviors to be reinforced, which makes the rationale for a contingency less convincing.

The Project used contingent rent reductions instead. The initial rent is set at a level sufficient to pay for all expenses such as mortgage, electricity, taxes, repairs, and insurance. Included in this figure is an amount sufficient to pay for a cook, janitor, and maintenance man. The members can therefore reduce their rent by that amount ($40) by performing the work that would otherwise be done by these paid employees. This consequence has never been questioned and seems to be viewed as appropriate and reasonable by the members.

Fourth, it was necessary to develop a behavioral system that was peer administered. The use of nonresidents was viewed as impossible because it would inevitably reduce the residents' privacy and control over their living environment. If privacy and control are reinforcing, then such outside administration would decrease the probability of residents moving in and staying. Or, it would increase the probability of the residents voting out those aspects of the system

that require such outside administrators. Thus, the system now uses peers to keep track of credits, impose contingencies, undertake behavioral inspections, and manage finances. A technology has been developed and is now being evaluated that permits the House to train its members rapidly and effectively in the detailed duties required of all administrative positions. This technology consists of approximately 80 training manuals containing about 2000 pages of self-instructional matter.

Thus, the Worksharing System may be viewed as both an extension of point economies from institutionalized to noninstitutionalized settings and as an extension from dependent populations to legally competent adult populations. While some of these features have appeared in some other economies, the total package employed in this application probably carries participant control over all aspects of the system further than in previous economies. In fact, the system is essentially a self-management or self-control system for groups.

The Experimental Living Project selected the sharing of housework as the first major goal in developing a behavioral system for group living. However, the selection of pleasant social interactions might seem to be a more obvious first goal in developing such a system, particularly since such interactions are usually asserted to be the major goal of such living arrangements. Worksharing was selected as the initial target behavior for several reasons. First, accounts of experimental living arrangements that appear in periodical literature frequently point to the breakdown of the equal sharing of housework as a major cause of the failure of communal experiments. Second, breakdown of worksharing can plausibly be viewed as the withdrawal of reinforcement from the members, and firm evidence exists that such a withdrawal leads to aggression (Azrin, Hutchinson, and Hake, 1969). Thus, the breakdown of the worksharing system could well be an impediment to pleasant social interactions. Third, the technology of applied behavior analysis currently has been more successfully developed with respect to work behavior than interpersonal behavior. By selecting worksharing as a major goal, the Project eliminated a frequently cited reason for failure of communes, eliminated a possible cause of interpersonal aggression, and utilized one of the strongest technologies currently available to applied behavior analysts.

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