

**RESPONSE MAINTENANCE  
AND PAPER RECYCLING\***

**J. V. COUCH**

**TERRY GARBER**

**LORI KARPUS**

*James Madison University*

**ABSTRACT**

By distributing raffle tickets for the return of recyclable paper it was possible to increase the amount of returned paper in two female dorms on a university campus. In one dorm the paper per raffle ticket ratio was gradually increased in an effort to increase the response maintenance. The increase in this ratio maintained the level of paper returned during the Raffle condition but did not lead to response maintenance following the termination of the Raffle condition. Participation levels were also analyzed and discussed.

Since the late 1960's increasingly more people have become concerned about ecological issues. News media, presidential campaigns, state campaigns, national and local organizations have all implored their respective populations to conserve and reuse our natural resources.

The problem of motivating people to engage in ecological behaviors has been addressed by psychologists. A considerable

\* This research was sponsored by a grant from the James Madison University Program of Grants for Faculty Research.

number of research reports have been published which describe the application of reinforcement principles in an effort to increase ecological behaviors. Tusso and Geller and Kazdin have recently published excellent reviews of this literature [1, 2].

The focus of the present investigation was paper recycling. Previous work by Geller and his associates has indicated that it is possible to increase the amount of recyclable paper returned to a collection room when raffle tickets are awarded to college students [3, 4]. In the most recent investigation Witmer and Geller reinforced college students with one raffle ticket for each pound of recyclable paper they returned [4]. This reinforcement condition significantly increased the amount of returned paper. However, the number of college students participating in the project was very low (less than 15%). In addition when the raffle condition was terminated the amount of paper returned dropped drastically (from 488 pounds to 31 pounds for one dorm). This immediate drop in the return of paper concurrent with the termination of the reinforcement program indicates the absence of response maintenance. The problem of no response maintenance has been encountered by other investigators using other response systems [5]. If reinforcement procedures are going to be truly effective in the modification of ecological behavior then the existing procedures must be modified so as to generate more participation during the program and a greater maintenance of the behavior change once the program is terminated. This latter problem is experimentally addressed in the present investigation.

One technique to increase response maintenance that has been very effective in other situations has been to gradually reduce the reinforcement density [6, 7]. One way this reduction can be accomplished is to increase the number of responses which must be made before a reinforcement is delivered. For example, in a paper recycling situation similar to Witmer and Geller's the amount of paper per raffle ticket could gradually be increased from one pound per ticket to two pounds per ticket, etc. On the basis of previous research it would be predicted that this manipulation should increase the degree of response maintenance when the reinforcement program is terminated.

In the present study two dorms of college females were given raffle tickets when they brought recyclable paper to a collection room. For one dorm the ratio of pounds of paper to raffle tickets was gradually increased in an attempt to increase the magnitude of response maintenance.

## Method

### SUBJECTS AND SETTING

The residents of two female dorms (Dorm H and Dorm D) on the campus of James Madison University served as subjects. Both dorms were identical in size and layout with each dorm housing 197 students. A majority of the students in each dorm were juniors. Paper was collected in an area adjacent to the main lounge of each dorm. The collection room was open from 9:00 until 11:00 on Sunday through Friday night.

### GENERAL PROCEDURE

Each collection room was staffed by one or two undergraduate research assistants. Each time a student brought paper to the collection room the student's name was checked against a master roll to verify that she was a resident of the dorm. After this verification, the resident's paper was weighed on a kitchen scale and the appropriate number of raffle tickets given to the resident. The raffle tickets had two parts each with identical six digit numbers. One part was given to the resident and the second part deposited in a box. For each exchange the research assistant recorded the resident's name, the number of pounds of paper returned, and the raffle ticket numbers for the tickets that were delivered.

On Sunday nights, between 8:00 and 8:45 p.m. a drawing was held in each dorm. Three tickets would be drawn, one at a time, from the box. The holder of the other half of the first ticket drawn had her choice of three prizes. The holder of the other half of the second ticket drawn had her choice of the remaining two prizes. The holder of the other half of the third ticket drawn received the remaining prize. This procedure allows for a "menu" of reinforcers which, on the basis of Ayllon and Azrin's research, has been shown to be a more effective reinforcement system than the use of single reinforcers [8]. In addition, the three weekly winner's tickets were entered in a Grand Drawing which was held at the end of the project. There was a separate Grand Drawing for each dorm. Due to the above procedure a resident was required to be present, or have a proxy, in order to win a prize if her ticket was drawn. After each weekly drawing the tickets for that week were destroyed.

Some of the raffle prizes were donated, but most of the prizes were purchased from local merchants. The total value of each weekly set of prizes for each dorm was about \$15. All of the prizes were gift certificates which could be redeemed for merchandise or

services. For example there were gift certificates for haircuts, records, pizzas, movies, food at a delicatessen, clothing from a department store, and plants. The grand prize was a \$20.00 gift certificate which was to be applied to a dinner for two at a local restaurant.

Throughout the project a large poster (56 x 71 cm) was taped to the wall adjacent to the collection room. This poster listed the rules of the raffle, the weekly prizes, the prize of the Grand Drawing, and the paper to ticket ratio. In addition, a similar size poster containing a pro-recycling statement was placed on the wall of each dorm lobby.

## EXPERIMENTAL TREATMENTS

The study was conducted for a total of eight weeks. Below is a chronological presentation of the experimental conditions in effect in each dorm during each week of the study.

*Week B1* — During the first week both dorms were in the BASELINE condition. Posters (56 x 71 cm) were placed at several locations on each floor of the dorm encouraging the residents to return recyclable paper to the collection room. These posters indicated where the collection room was located, what time it was open, and what days it was open. During the Baseline condition when a resident brought paper to the collection room the paper was accepted and the resident politely thanked. On Saturday of the Baseline week each resident received a printed sheet. These sheets contained an explanation of the recycling project, an announcement that the raffle would start on the following Sunday, and a copy of the rules under which the raffle was to be operated. A copy of the rules is shown in Figure 1. These sheets were placed under each residents dorm door. In addition, a poster describing the rules, prizes, etc. was placed next to the collection room.

*Week R1* — Both dorms started the RAFFLE condition. In both dorms the paper per ticket ratio was set at one-half pound per ticket. That is, a resident received one raffle ticket for each one-half pound of paper she delivered to the collection room.

*Week R2* — Both dorms continued in the Raffle condition with a one-half pound per ticket ratio.

*Week R3* — Dorm H remained on the one-half pound per ticket ratio while Dorm D was switched to a one pound per ticket ratio.

1. ONLY PAPER MATERIAL WILL BE ACCEPTED (E.G., NOTEBOOK PAPER, NEWSPAPER, MAGAZINES, ETC.).
2. EACH INDIVIDUAL PARTICIPATING MUST BE A RESIDENT OF THIS DORM.
3. MATERIALS MAY BE BROUGHT TO THE COLLECTION ROOM IN THE LOUNGE BETWEEN 9 AND 11 P.M. SUNDAY THROUGH FRIDAY.
4. ONE TICKET WILL BE GIVEN ACCORDING TO THE FOLLOWING SCHEDULE:
 

½ – 1 POUND	1 TICKET
1 – 1½ POUNDS	2 TICKETS
1½ – 2 POUNDS	3 TICKETS

EACH ADDITIONAL ½ POUND GETS 1 ADDITIONAL TICKET.
5. DRAWINGS WILL BE HELD ON SUNDAY EVENING BETWEEN 8:30 AND 9:00 IN THE DORM LOUNGE.
6. THREE PRIZES WILL BE AWARDED PER DRAWING. (THE HOLDER OF THE FIRST NUMBER DRAWN WILL CHOOSE AMONG 3 ALTERNATIVES, THE HOLDER OF THE SECOND NUMBER DRAWN WILL CHOOSE AMONG THE REMAINING 2 ALTERNATIVES, AND THE HOLDER OF THE THIRD NUMBER DRAWN WILL RECEIVE THE REMAINING PRIZE.)
7. THE NAMES OF THE THREE WINNERS OF EACH DRAWING WILL BE ENTERED IN THE GRAND DRAWING.
8. EACH WEEK'S PRIZES WILL BE LISTED BY THE COLLECTION ROOM IN THE LOUNGE.
9. THE PRIZE FOR THE GRAND DRAWING IS A \$20.00 CERTIFICATE TO BE APPLIED TO A MEAL FOR TWO AT ANY OF THE PALMER HOUSE RESTAURANTS IN HARRISONBURG.

Figure 1. The rules for the Raffle Condition.

The pound per ticket ratio in item number 4 was constant throughout the Raffle condition for Dorm H, but was varied during weeks R3-R6 for Dorm D.

*Week R4* — Dorm H remained on the one-half pound per ticket ratio while the ratio in Dorm D was increased to two pounds per ticket.

*Week R5* — Dorm H remained on the one-half pound per ticket ratio while the ratio in Dorm D was again increased, this time to three pounds per ticket.

*Week R6* — Both dorms remained on the same paper per ticket ratio as during week 5.

*Week B2* — Both dorms returned to the BASELINE condition. This switch *was not* announced in the dorms prior to the initiation of the condition on Sunday night.

## MISCELLANEOUS PROCEDURES

The paper collected during the week was removed from each dorm on Saturday morning. The paper was loaded into a car and the car plus paper weighed. The paper was then donated to Earthkeepers, a local recycling center. The car was then re-weighed and the difference in weights used as a measure of the amount of paper collected from both dorms. This served as a reliability check and in all cases the discrepancy between the total weight and the sum of the daily weights was very slight (no more than 5 pounds).

Some investigators have differentiated between paper delivered during the hours the collection room is open and paper left near the collection room when the room is not open [3]. Only several times during the present study did individuals leave paper when the collection room was not open. This paper was kept separate and did not enter any of the daily or weekly tabulations.

## Results

### POUNDS OF PAPER

Figure 2 presents the total number of pounds of paper delivered to the collection room for the two Baseline weeks (B1 and B2) and for the six Raffle weeks (R1-R6) in Dorm D and Dorm H. As can be seen from Figure 2, during the first Baseline week (B1) the residents of Dorm D returned eighty pounds of paper while the residents of Dorm H returned fifty-four pounds of paper. During the Raffle condition the residents of Dorm D returned an average of 317.5 pounds of paper per week while the residents of Dorm H returned an average of 445.2 pounds of paper. The difference between the two dorms could be due to either or both of two factors. First, the variation in the ratio of paper to raffle tickets could account for the difference in amount of paper returned. However, since the difference was apparent during the first week of the Raffle condition, when both dorms were under the same ratio, this explanation would seem to be lacking. Another possibility lies in the residents themselves. In Dorm H, two residents were responsible for returning 58 per cent of the total amount of paper brought to the collection room. The difference between Dorm D and Dorm H is most likely the result of the efforts of these two women.

During the Raffle condition the average amount of paper returned per visit was 12.84 pounds for Dorm D and 26.10 pounds for Dorm H. This difference between Dorm H and Dorm D was due to the large amount of paper returned by the two residents of Dorm H.

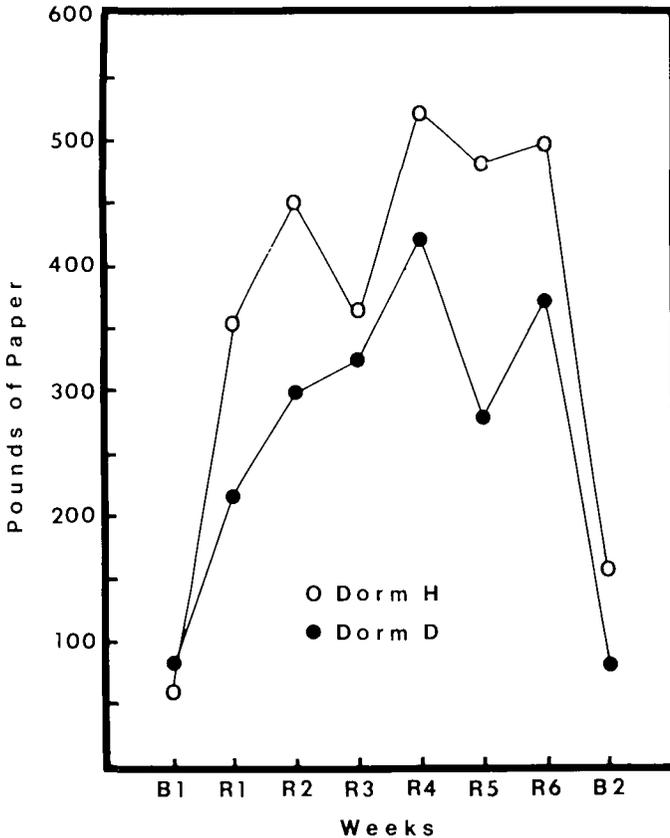


Figure 2. Pounds of paper per week for Dorm H and Dorm D.

During the second Baseline week the amount of paper returned dropped drastically. For Dorm D only eighty-one pounds of paper were returned while for Dorm H only 159 pounds were returned. Most of this paper was returned on the first night of B2 which would be expected since the residents were not informed that the Raffle condition has been terminated.

#### PARTICIPATION

Across the entire investigation, sixty-two residents (32%) from Dorm D and forty-four residents (22%) from Dorm H made one or more visits to the collection room. Considering both dorms together there were a total of 327 visits to the collection room (194 visits for Dorm D and 137 visits for Dorm H) during the eight weeks of the

Table 1. Frequency Distribution of the Number of Residents and the Number of Visits to the Collection Room Across Both Dorms

<i>Number of Visits</i>	<i>Number of Residents</i>
14 and over	3
13	1
12	1
11	0
10	0
9	2
8	2
7	3
6	2
5	8
4	5
3	10
2	23
1	45

project. Table 1 presents a frequency distribution of the number of residents visiting the collection room one or more times. As can be seen a majority of the residents visited the collection room only once.

Figure 3 shows the number of new participants for each week of the project in each dorm. A new participant was defined as a resident who had not previously delivered paper to the collection room. As can be seen from Figure 3 there was an increase in new participants with the initiation of the Raffle condition. However, after the first week of the Raffle condition the number of new participants decreased throughout the project. Further, it can be seen that Dorm D had consistently more new participants throughout than Dorm H. This result is probably due to individual dorm differences.

### Discussion

The results of the present investigation lend further support for the use of reinforcement principles to modify ecological behaviors. The introduction of a Raffle condition increased substantially the amount of paper returned. Further the present results indicate that a "leaner" schedule of reinforcement (3 pounds of paper per ticket)

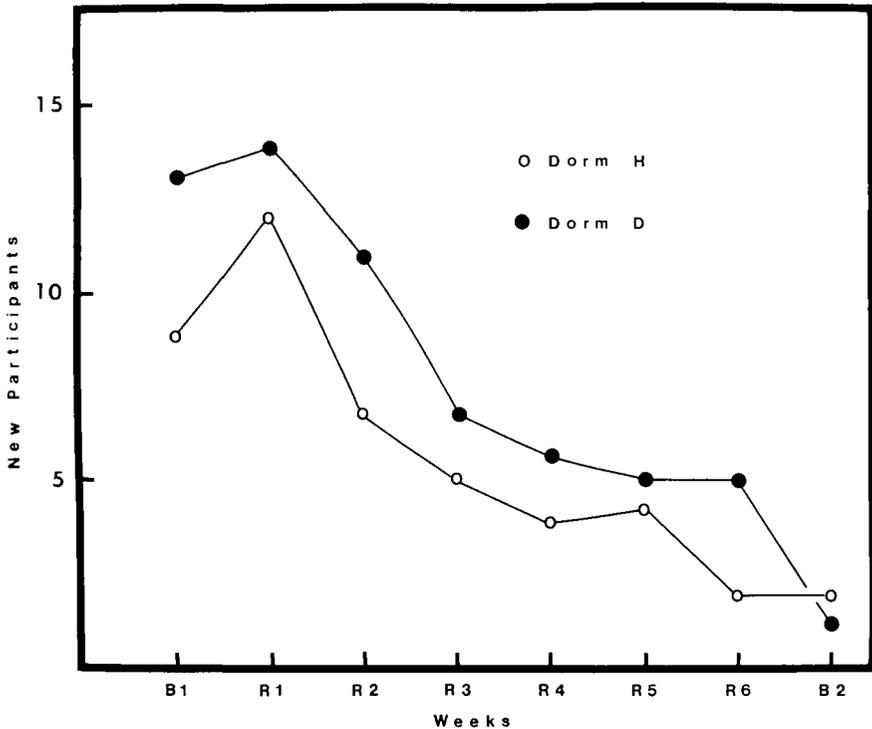


Figure 3. Number of new participants per week for Dorm H and Dorm D.

than has been used previously can maintain the increase in paper return [3, 4]. This finding bears directly on the cost-effectiveness of future and possibly larger scale projects.

The disappointing finding of the present investigation was that the variation in the ratio of paper to tickets did not lead to response maintenance. As indicated previously past research would lead to the prediction that an increase in the ratio would lead to an increase in the response maintenance when the Raffle condition was terminated. This clearly was not the case in the present project. Whether the absence of response maintenance is a critical flaw in the application of reinforcement principles to ecological behavior is yet to be determined. Further research may derive a set of procedures to increase response maintenance. A different solution to the problem of response maintenance has recently been proposed by Kazdin [2]. Kazdin suggests that reinforcement programs need not be terminated which, of course, would eliminate the problem of response maintenance. The present finding that individuals will continue to

return paper even if the pay-off is reduced lends practical support to Kazdin's suggestion. Further research needs to be completed to determine the limits individuals will tolerate in terms of a reduced pay-off.

One final observation relates to participation levels. The average participation level in the present project was 27 per cent which is above the level reported by Geller [3, 4]. However, this level leaves a lot to be desired. Reference to Figure 3 indicates that the number of new participants gradually decreased after the first week of the Raffle condition. From inspection of Table 1 it is apparent that most of the residents made only a few visits to the collection room during the project. In order for a reinforcement program to change an individual's behavior the individual must be exposed to the reinforcement contingencies, e.g., get a raffle ticket(s) and have a reasonable chance of winning a prize. Individuals who only once or twice bring a few pounds of paper to the collection room are not maximizing their chances of winning a prize. With this situation the individual's ecological behavior will not be reinforced which will result in the extinction of that behavior. If reinforcement procedures are going to be effective in modifying ecological behavior then procedures must be implemented to reduce the chance of extinction of the very behavior the program hopes to reinforce. Such procedures might entail the use of a "sliding scale" for purchases of back-up reinforcers. For example, individuals could immediately redeem their tickets for items of small values or save their raffle tickets for items of greater value. This procedure is similar to the use of trading stamps as a reinforcer for shopping in certain stores. With procedures such as the one just described it might be possible to significantly increase the number of participants and, at the same time, maintain the participation level at a fairly constant level. By means of such programs the efficient use of reinforcement to modify ecological behavior would become more realistic.

#### REFERENCES

1. M. Tuso and E. S. Geller, Behavior Analysis Applied to Environmental/ Ecological Problems: A Review, *Journal of Applied Behavior Analysis*, 9, p. 526, 1976.
2. A. E. Kazdin, Extensions of Reinforcement Techniques to Socially and Environmentally Relevant Behaviors, M. Hersen, R. M. Eisler, and P. M. Miller (eds.), *Progress in Behavior Modification*, 4, Academic Press, New York, 1977.
3. E. S. Geller, J. L. Chaffee, and R. E. Ingram, Promoting Paper Recycling on a University Campus, *Journal of Environmental Systems*, 5:1, pp. 39-57, 1975.

4. J. F. Witmer and E. S. Geller, Facilitating Paper Recycling: Effects of Prompts, Raffles, and Contests, *Journal of Applied Behavior Analysis*, 9, pp. 315-322, 1976.
5. R. Kohlenberg, T. Phillips, and W. Procter, A Behavioral Analysis of Peaking in Residential Electrical-Energy Consumers, *Journal of Applied Behavior Analysis*, 9, pp. 13-18, 1976.
6. A. E. Kazdin, *Behavior Modification Applied Settings*, Dorsey Press, Homewood, Illinois, 1975.
7. B. F. Skinner, *The Behavior of Organisms*, Appleton-Century-Crofts, New York, 1938.
8. T. Ayllon and N. Azrin, *The Token Economy: A Motivational System for Therapy and Rehabilitation*, Appleton-Century-Crofts, New York, 1968.

#### ACKNOWLEDGEMENTS

The authors are indebted to the following individuals who helped in the collection of the data: Jan Berry, Cathy Field, Colette Leary, Taffy Miller, Wendy Oberst, Kathy Parkhill, Donna Prideaux, Beth Skinner, and Jill Summerville. The authors would also like to acknowledge the assistance of William O. Hall, Jr. and Michael M. Webb.

Direct reprint requests to:

J. V. Couch  
Department of Psychology  
James Madison University  
Harrisonburg, Virginia 22801