EFFECTIVENESS AND COST OF LITTER (TRASH) REMOVAL IN AN AMUSEMENT PARK AS A FUNCTION OF INCENTIVE PROCEDURES AND AGE OF THE CHILDREN

An Abstract of a thesis by
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The problem. An incentive procedure designed to facilitate litter removal in an amusement park was evaluated in this study.

Procedure. A constantly changing population of vacationing children of varying ages were offered complimentary tickets for amusement park rides contingent upon bags of litter picked up in the park. The per cent of litter removed, the number and size of sacks filled, the number and reported ages of children participating, the number of tickets issued, the number of tickets redeemed, and the cost of rides for which they were redeemed were all recorded.

Findings. A cost and effect analysis showed that this particular incentive program for litter removal was approximately two and one half times as effective at about the same cost as traditional salaried maintenance. Overall, eight to fourteen year olds were the most efficient. Large litter was consistently picked up more thoroughly than small litter, especially by the children.

Conclusions. Incentive procedures for litter removal appear to be preferable to traditional maintenance procedures in an amusement park in terms of both cost and effectiveness.

Recommendations. Similar projects could be effectively maintained in other settings with minimal supervision.
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LaDeane Casey
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CHAPTER I
INTRODUCTION

Ecologically minded citizens have become increasingly concerned about the problem of litter. Traditional techniques for litter control appear to be inadequate. Recently, a number of new litter control techniques have been investigated.

Several investigators have studied the relationship between prompting procedures and litter removal. Burgess, Clark, and Hendee (1971) investigated litter removal procedures in two movie theaters. Results showed no decrease in litter with an increase in anti-litter propaganda (prompting) in the form of a film strip and litterbags with printed instructions. However, more recent research has indicated that prompting may be effective. Geller (1973) found that handbills and posted, printed messages increased the proportion of appropriate waste disposal in five of six environments (a grocery store, two theaters, a snack bar, a lobby of a college building, and a college classroom). The proportion of appropriate waste disposal increased in all but the college classroom. Subsequently, Geller, Farris, and Post (1973) investigated the relative effectiveness of different prompting procedures. The effect of five different prompts on the probability that customers entering a grocery store would select their soft drinks in returnable rather than nonreturnable containers was assessed. The
prompts that were used included distribution of handbills with unobserved charting and four conditions of distribution of handbills with public charting, in which the sex and number of students doing the obvious charting was varied. These prompting techniques appeared to be equally effective and increased the consumers' selection of returnable containers behavior by 25%.

Techniques for handling littering behavior based on incentive procedures designed to encourage litter removal have also been investigated. Burgess successfully scheduled positive consequences contingent upon litter collection in movie theaters (Burgess et al., 1971) and forest campgrounds (Clark, Burgess, & Hendee, 1972). Geller, Wylie, and Farris (1971) combined prompting and social reinforcement to increase purchase of drinks in returnable, instead of disposable, bottles. Kohlenberg and Phillips (1973) found that a modified variable ratio reinforcement schedule (e.g. reinforcement was delivered for every tenth litter deposit on the average) increased appropriate litter removal. Powers, Osborne, and Anderson (1973) found that small monetary rewards increased litter removal in unsupervised areas of a United States Forest Service area. Incentive procedures designed to facilitate litter removal have generally been found to be effective.

Litter removal effectiveness has occasionally been judged by an increase in the litter in trash receptacles
rather than a decrease of ground litter (Kohlenberg & Phillips, 1973; Powers et al., 1973). Consequently, the measure of litter removal effectiveness may have represented litter brought into the area rather than litter picked up in the area.

Children have often been included in the target population of these studies (Clark et al., 1972; Burgess et al., 1971; and Kohlenberg & Phillips, 1973), probably because of the available reinforcers. The age of the participating children may be an important factor due to the relationship of age and the effectiveness of reinforcers.

Although the effectiveness of the incentive procedures has been established, the relative cost of such procedures has not been assessed. Several authors have suggested that cost-effect analyses should be conducted (Clark et al., 1972; Kohlenberg & Phillips, 1973). Questions pertaining to the age of children and the cost of the procedures must be answered in the context of a study designed to eliminate the possibility of including extraneous litter in the measure of litter removal effectiveness.
CHAPTER II

METHOD

Subjects

Subjects were children of vacationers frequenting an amusement park in a small lake-resort town in northern Iowa. Their participation was voluntary. The ages of the children varied according to the experimental conditions, i.e., twelve and under, all ages, and thirteen and older.

Setting

The amusement park was bounded on all sides by roller coasterer tracks enclosed by fences. Entry to the park could be gained only by three main entryways.

Procedure

Data were collected daily, except Tuesdays, from July 11, 1973 through August 17, 1973, for a total of 33 days. Tuesday was the maintenance man's day off. Individual amusement ride operators repaired the rides and removed some litter on Tuesday mornings. The park was open each day from approximately noon until midnight. All experimental conditions took place before noon when no customers were in the park. This facilitated both litter counting and litter removal.

Counting Procedures

The park was divided into six well-defined areas for facilitation of litter counting. A hand counter was used for small litter. Large litter items were tallied...
on a data sheet. Litter was recorded in three categories, two categories of large litter (cans and bottles, and large wrappers), and one category of small, miscellaneous litter.

Each morning, except Tuesday, each item of litter on the ground was counted and recorded in one of the three categories before and after litter removal procedures. The difference of those two counts was the number of ground litter items removed. The per cent of litter removed in each category was calculated each day by dividing the difference between the two counts by the first count.

Reliability

Twice a week, on varying days, two independent observers (used alternately) counted litter before and after litter removal. Their counts were made independently but at the same time as the daily litter count. Reliability was calculated by dividing the smaller number of ground litter items removed by the larger number. Mean overall reliability was 91% for seven days for one observer and 88% for four days for the other observer.

Baselines

An ABACAD design was used. During the baseline conditions, litter on the ground in the park was counted and tallied in one of the three categories every morning before the regularly employed maintenance man cleaned the park. After he had cleaned the park, litter remaining on the ground was counted and tallied again. In addition,
the number of minutes the maintenance man spent removing litter was recorded.

**Experimental Conditions**

During the three experimental conditions, children of various ages received a complimentary ticket for an amusement park ride for each bag of litter picked up in the park. During Experimental Condition I children twelve and under were eligible to participate. All ages were eligible under Experimental Condition II. Children thirteen and older could participate during Experimental Condition III. During those experimental conditions, litter on the ground in the park was counted and tallied in the three categories every morning both before and after the children had cleaned the park.

The children picked up large litter in large carry out grocery bags and/or small litter in ten inch bags which were filled only two thirds full so they could be closed to prevent spilling. Sweeping was encouraged in the paved areas. Because of the easily distinguishable boundaries of the amusement park, the children did not have access to litter procured from other areas. Trash receptacles distributed throughout the park were emptied before the children began picking up litter. The number and size of bags filled, the number and self-reported ages of children participating, the number of tickets issued, the number of tickets redeemed, and the cost of the rides for which they
were redeemed were all recorded.

During the three experimental conditions the project was publicized by means of a centrally located sign, posted in the park five days previous to, and during, each condition. The sign notified the public of the dates, times and ages of children who could pick up litter in the park in exchange for free ride tickets.
CHAPTER III
RESULTS

Per cent of large and small litter removed during each day in each of the three baseline and three experimental conditions is shown in Figure 1. Data were combined for the two categories of large litter (bottles and cans, and large wrappers) since the percentages of litter removal for both were similar in all conditions.

During the six days of Baseline I the hired maintenance man removed approximately 16% of the small litter and 23% of the large litter in the park. He removed approximately 24% of the small litter and 48% of the large litter during the first four days of the Baseline II condition. A new maintenance man was hired July 29, 1973. He removed approximately 34% of the small litter and 65% of the large litter over the fifth and sixth days of Baseline II, and 31% of the small and 50% of the large litter in Baseline III. Overall, he picked up approximately 54% of the large and 31% of the small litter. The mean per cent of all litter removed by both men for the three baselines was 27%.

The per cent of large and small litter removed each day by the children during the three experimental procedures is also shown in Figure 1. In Experimental Condition I, when participation in the project was limited to children twelve and under, approximately 93% of the large litter
Fig. 1. Per cent of large and small litter removed each day during the three baseline and the three experimental conditions.
and 45% of the small litter was removed. When children of all ages were allowed to participate in Experimental Condition II, 98% of the large litter and 79% of the small litter was removed. In Experimental Condition III, where participation was limited to children thirteen and older, 94% of the large litter and 80% of the small litter was removed. Overall, the children removed approximately 51% of the litter in Condition I, 82% in Condition II, and 82% in Condition III. Large litter was consistently removed more thoroughly than small litter, especially by the children. The younger children did not remove small litter as well as the other two age groups, but even they did better than the maintenance men.

Figure 2 shows the first litter count each day for each of the three baseline and three experimental conditions. The first counts during each day of Baseline I were comparatively high. Following the first day of Condition I, the first litter counts each day dropped to approximately one third of the baseline first counts. The first counts each day in succeeding baseline conditions showed a gradual buildup of litter. This buildup did not occur in Conditions II and III.

Figure 3 shows the mean number of volunteers over all days of eligibility for each age of child participating. For example, whenever thirteen year olds were eligible
Fig. 2. First litter counts each day over all baselines and all experimental conditions. Black circles represent litter counts made by the experimenter. Open circles indicate counts made by one of the two alternate observers.
Fig. 3. Histogram showing the mean number of volunteers and the mean number of bags of litter collected per volunteer per day for each category. The data have been combined over all three experimental conditions.
(i.e., Conditions II and III), on the average, 1.4 volunteered more frequently than other aged children. Figure 3 also shows the mean number of bags of litter picked up per volunteer per day. For example, each eleven year old picked up an average of 2.4 bags of litter per day during the two conditions for which eleven year olds were eligible. Children ages eight through fourteen were the most efficient.

Cost of salaried maintenance versus each condition of the incentive program is summarized in Table 1. The maintenance men spent approximately three hours each day removing litter. They were paid $1.90 per hour ($5.70) for the three hours of litter removal. This plus $0.25 per day for beach litter bags made a total maintenance cost of $5.95 per day.

The cost of the three experimental conditions included a $5.00 sign for publicity, the litter removal bags, and the cost of the rides. Although ride costs are included in Table 1, they were not considered a cost by the park management since the tickets could be redeemed only when rides were operating for paying customers. Litter bag costs were also included in Table 1 although the bags for this project were donated by a grocery store for their advertisement value. Experiment time spent distributing tickets for filled bags of litter was not included in the cost, because actual time involved was minimal and the task could easily be incorporated into the duties of any
# Table 1

## Daily Cost-Effectiveness of Litter Removal

<table>
<thead>
<tr>
<th></th>
<th>Salaried Maintenance</th>
<th>Condition I 12 years and Under</th>
<th>Condition II All Ages</th>
<th>Condition III 13 years and Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litter Removal Per Day</td>
<td>27%</td>
<td>51%</td>
<td>82%</td>
<td>82%</td>
</tr>
<tr>
<td>Litter Removal Per Day on Litter Removal</td>
<td>180</td>
<td>56</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td>Daily Maintenance Salary at $1.90 per hour</td>
<td>$5.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Publicity (Sign) Cost per Day prorated over 3 Conditions</td>
<td>$0.33</td>
<td>$0.33</td>
<td>$0.33</td>
<td>$0.33</td>
</tr>
</tbody>
</table>
### TABLE I

**DAILY COST-EFFECTIVENESS OF LITTER REMOVAL** (Continued)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Salaried Maintenance</th>
<th>Condition I 12 years and Under</th>
<th>Condition II All Ages</th>
<th>Condition III 13 years and Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Cost per Day for Bags</td>
<td>$0.25</td>
<td>$0.13</td>
<td>$0.15</td>
<td>$0.16</td>
</tr>
<tr>
<td>Mean Number of Tickets at each of 3 Prices Redeemed per Day</td>
<td>$0.60</td>
<td>3.0</td>
<td>6.3</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>$0.40</td>
<td>5.8</td>
<td>4.8</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>$0.25</td>
<td>0.8</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Mean Total Cost of all Tickets Redeemed per Day</td>
<td>$4.32</td>
<td>$5.87</td>
<td>$7.41</td>
<td></td>
</tr>
<tr>
<td>Mean Total Cost per Day</td>
<td>$5.95</td>
<td>$4.78</td>
<td>$6.35</td>
<td>$7.90</td>
</tr>
<tr>
<td>Cost/Per Cent Litter Removal</td>
<td>$5.95/27</td>
<td>$4.78/51</td>
<td>$6.35/82</td>
<td>$7.90/82</td>
</tr>
<tr>
<td>Cost-Effect Index</td>
<td>.22</td>
<td>.09</td>
<td>.08</td>
<td>.10</td>
</tr>
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</table>
of the concession operators. Total maintenance costs for Conditions I, II, and III were $4.78, $6.35, and $7.90 respectively. The cost-effectiveness index (cost per percent of litter removed) was .22 for traditional maintenance and .09, .08, and .10 for Conditions I, II, and III respectively. The experimental procedures were approximately two and one half times less expensive than salaried maintenance.
CHAPTER IV
DISCUSSION

Two special circumstances in this park made the procedures relatively simple to employ. These were the fact that the area was fenced and that it was closed to the public each morning. This reduced the possibility that extraneous litter could have been carried into the park by the children. However, even if that had occurred it would not have been included in the measure of litter removal effectiveness, since that measure was the inverse of the percent of litter left on the ground after litter removal procedures were completed.

During the first baseline condition a large amount of litter remained on the ground for the first litter count each morning. This probably was accounted for by the small percentage of litter removed by the maintenance man each day. When the children then removed a larger percentage of the litter, the first litter counts each day were much lower. This indicates that the children removed litter which had remained in the park during the baseline conditions.

Children eight through thirteen years of age volunteered frequently, however, the thirteen year olds were the most efficient. This could be a function of the particular reinforcers available in the amusement park setting, i.e., tickets for rides. Thirteen year olds might not be the most
efficient in other settings where other reinforcers were available.

In this study no attempt was made to separate prompts from incentives; however, the prompts were limited to the sign and minimal verbal instructions concerning bag size. The previously mentioned recent studies (Burgess, et al., 1971; Clark et al., 1972; Geller et al., 1971; Geller, 1973; Geller et al., 1973; Kohlenberg & Phillips, 1973; and Powers et al., 1973) demonstrated the effectiveness of incentive procedures and the use of prompts for litter removal. This study supplies supplemental information in regard to the cost-effectiveness of litter removal as a function of an incentive procedure and the age of the children participating. The cost-effectiveness index indicated that the incentive procedures were all approximately two and one half times less expensive for the same degree of effectiveness as the traditional litter removal procedures in this amusement park. Since incentive procedures for litter removal are both efficient and economical, their use in various settings should be encouraged.
REFERENCES


