


**CORPORATE RECYCLING: INTERVENTIONS AND PERSON VARIABLES
ASSOCIATED WITH PARTICIPATION**

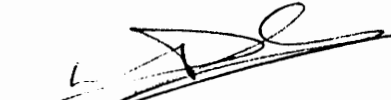
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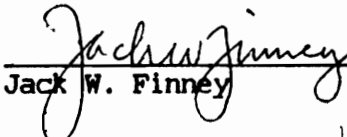
Lawrence D. Needleman

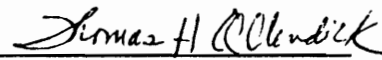
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"Most thoughtful people agree that the world is in serious trouble. A nuclear war could mean a nuclear winter that would destroy all living things; fossil fuels will not last forever, and many other critical resources are nearing exhaustion; the earth grows steadily less habitable; and all this is exacerbated by a burgeoning population that resists control. The timetable may not be clear, but the threat is real. That many people have begun to find a recital of these dangers tiresome is perhaps an even greater threat.

Why is more not being done? Within a single generation, we have made extraordinary progress in the exploration of space, genetic engineering, electronic technology, and many other fields, but little has been done to solve what are certainly more serious problems. We know what could be done: We could destroy all nuclear weapons, limit family size, and adopt a much less polluting and less wasteful style of life. The mere listing of these steps is enough to show how far we are from taking them (Skinner, 1987)."

". . . humankind should consider itself as being on the verge of emerging from its infancy, having been sustained by a generous world tolerant of humanity's mistakes and ignorance (Allen, 1991)."

Doom! Doom!
You have destroyed
A beautiful world
With relentless hand,
.
.
.
Magician,
Mightiest of men,
Raise your world
More splendid than before,
From your heart's blood
Build it up again!
Create a new cycle
From the splendors of sense to adorn;
You'll hear life
Chant a new and fresher song.

Goethe

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by

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Psychology

(ABSTRACT)

The efficacy of five different types of interventions for increasing the number of participants and the quantity of recyclables collected in a corporate-based recycling program were compared. Employees at a corporate research center (N=443) associated with a large state university were asked to bring aluminum cans, glass, and newspaper from home to bins located at work. In addition, in order to track individual employee's recycling behavior, they were asked to write identifying information on each bag of recyclables (i.e., last 4 digits of social security number or a computer identification name). Interventions included appeal messages, two kinds of reciprocity interventions, goals plus feedback, and raffles. A quasi-experimental, modified multiple baseline design was used. More specifically, interventions were given to one building first, and then after a delay, they were administered to the other three buildings simultaneously. Program and intervention information were disseminated by either traditional office memos, electronic mail, or phone mail. Results indicated that only a small percentage of employees participated in the program, and raffles were the only

interventions that reliably increased the number of participants and quantity of recyclables.

In the hope of being able to predict which employees would participate in the recycling program, prior to the interventions, employees were asked to complete a questionnaire assessing attitudes towards recycling and person variables. More specifically, employees' optimism, environmental concern, beliefs regarding their ability to control environmental outcomes (i.e., "environmental locus of control"), and psychological reactance were assessed. Mean scores on the environmental concern and environmental locus of control scales indicated that employees were quite concerned about the environment and believed that their behavior could have a positive impact on it. Although psychological reactance scores reliably depended on employees' recycling status (i.e., whether they were non-participants in the recycling program, infrequent participants, or frequent participants), neither it nor any of the other variables could accurately differentiate participants from non-participants in the program. Reasons for the low participation rates and the discrepancy between person variables and participation were discussed, and suggestions for improving future research in this area were made.

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TABLE OF CONTENTS

INTRODUCTION 1

Environmental Problems and Potential Solutions 1

 "High-Tech" Strategies 1

 "Low-Tech" Strategies 2

 Benefits of Recycling 5

Overview 5

Behavioral Intervention Strategies Used to Motivate Recycling 6

 Antecedents 10

 Prompts 10

 Written Prompts 10

 Verbal Prompts 13

 Combination of Written and Verbal Prompts . . . 13

 "Foot-in-the-Door" Technique 14

 "Rejection-then-Retreat" Technique 17

 "Indebtedness" Technique 20

 Indigenous Intervention Agent 20

 Convenience 24

 Goals 27

 Consequences 28

 Feedback 28

 Goals Plus Feedback 29

Table of Contents (continued)

Rewards	33
Individual Rewards	33
Group Rewards	35
Comparative Efficacy of Reward Strategies	35
Conclusions Regarding Behavioral Intervention Strategies	36
Setting	37
Electronic and Phone Mail as Intervention Tools	40
Social Marketing: Matching Person Variables and Intervention Characteristics	42
Social Cognitive Framework	43
Expectancies	45
Locus of Control	45
Unrealistic Optimism for Future Life Events	48
Subjective Values of the Outcomes	52
Psychological Reactance	53
Encoding	54
Conclusions	56
Major Goals of the Present Research	57

Table of Contents (continued)

Hypotheses	58
Efficacy of Electronic and Phone Mail	58
Relative Effectiveness of Intervention Strategies	59
Concurrent and Discriminative Validity of the Environmental Locus of Control Scale	59
Person Variables and Participation in the CRC Recycling Project	60
Preliminary Research	62
METHOD	69
Setting and Subjects	69
Experimental Procedures and Design	71
Person Variables Questionnaire	71
Abbreviation of the Rotter I-E Control Scale	73
Development of the Environmental Locus of Control Scale	74
Data Collection	74
Modes of Communication	76
Description of Intervention Techniques	77
Experimental Design	81

Table of Contents (continued)

RESULTS	84
Reliability	84
Comparison of Intervention Components	85
Person Variables and Recycling	92
Environmental Locus of Control Scale (ELOC)	94
Concurrent and Discriminative Validity of the ELOC	94
Relationship between Criteria Scores and Scale Scores .	97
DISCUSSION	106
Intervention Techniques	106
Person Variables	112
Future Directions	116
Increasing Participation in Recycling Programs	116
Predicting Behavior from Questionnaire Data	119
Beneficial Effects of the Current Research	120
Concluding Comment	121
REFERENCES	124
APPENDICES	141
VITA	184

List of Figures

- Figure 1. Number of employees delivering glass or aluminum during consecutive collection days of the preliminary study (p. 66)
- Figure 2. Schematic of the Corporate Research Center (p. 70)
- Figure 3. Experimental Design (p. 82)
- Figure 4. Number of aluminum can deliveries and quantity of cans delivered at each building during consecutive weeks of the study (p. 88)
- Figure 5. Number of newspaper deliveries and pounds of newspaper delivered at each building during consecutive weeks of the study (p. 89)
- Figure 6. Number of glass deliveries and pounds of glass delivered at each building during consecutive weeks of the study (p. 90)
- Figure 7. Number of employees having low and high psychological reactance scores at different participation levels (p. 104)
- Figure 8. Multiple Intervention Level Hierarchy Model (p. 109)

List of Tables

- Table 1. Advantages of a corporate based recycling program (p. 38)
- Table 2A. Number of deliveries of each type of recyclable during each intervention (p. 86)
- Table 2B. Quantity of each type of recyclable delivered during each intervention (p. 86)
- Table 2C. Mean quantity of each type of recyclable per delivery (p. 86)
- Table 3. Correlations between the Environmental Locus of Control Scale and the other person variables (p. 96)
- Table 4A. Correlations between person variables and criteria variables for the full sample of CRC employees (p. 98)
- Table 4B. Correlations between person variables and criteria variables for the "No Curb" subsample of employees (p. 99)
- Table 5. Mean scale scores for the different frequency-of-participation levels for the "No Curb" subsample (p. 101)
- Table 6. P-values for the Chi-Square tests for each person variable by participation level (p. 103)

List of Appendices

- Appendix A-1. Message inquiring about employees' curbside recycling status (preliminary study, p. 141)
- Appendix A-2. Message providing employees with details about the CRC recycling program (preliminary study, p. 142)
- Appendix A-3. Reminder message (preliminary study, p. 143)
- Appendix B. Cover page for the questionnaire (p. 144)
- Appendix C. Scales comprising the questionnaire battery (p. 145)
- Appendix D. Message informing employees the starting date of the recycling program (p. 158)
- Appendix E. Sample of signs posted on recycling bins (p. 159)
- Appendix F-1. First appeal message (p. 160)
- Appendix F-2. Second appeal message (p. 161)
- Appendix G. "Foot-in-the-Door"/"Rejection-then-Retreat" Message (p. 162)
- Appendix H. Indebtedness Message (p. 163)
- Appendix I-1. First goals plus feedback message (p. 164)
- Appendix I-2. Second goals plus feedback message (p. 165)
- Appendix J-1. First raffle message (p. 166)
- Appendix J-2. Second raffle message (p. 167)

List of Appendices (continued)

- Appendix K. Individual employees' patterns of delivery of each type of recyclable (p. 168)
- Appendix L. Item-total correlation coefficients for the Environmental Locus of Control Scale (p. 172)
- Appendix M. Mean scale scores for each of the frequency-of-participation levels for the full CRC sample (p. 173)
- Appendix N-1. Cross tabulation tables for scale scores by participation level for the full CRC sample (p. 174)
- Appendix N-2. Cross tabulation tables for scale scores by participation level for the "No Curb" subsample (p. 179)

INTRODUCTION

Environmental Problems and Potential Solutions

Pollution, acid rain, depletion of the ozone layer, depletion of natural resources, extinction of species, increased concentrations of "Greenhouse" gases, and the scarcity of landfill space are among the urgent environmental problems threatening the earth (Brown, 1990; Oskamp, 1983; Oskamp, 1989; "Ozone layer," 1990; Union of Concerned Scientists [UCS], 1990a, 1990b, 1990c; Wald, 1990).

Recently, an environmental problem that has captured a great deal of attention from U.S. citizens and politicians is the solid waste crisis. During the last 60 years, the quantity of solid waste has increased at a rate approximately five times greater than the population's growth rate (Melosi, 1981). Landfills are reaching capacity and need to be replaced, incinerators are being shut down as a result of citizens' health concerns, and the cost of community waste disposal has sky-rocketed.

"High-Tech" Strategies

While engineering technology and human behavior are responsible for environmental degradation, they can also contribute to preserving the environment. Since Western Culture places a great deal of faith in science and technology to solve its problems, many Westerners advocate high-tech solutions to environmental problems. Indeed, many

engineering advances reduce environment destruction. For example, scientists are increasing the efficiency of gas and coal powered turbines (Wald, 1990); they are finding ways to convert certain hazardous materials into safe and useful objects (e.g., adding rubber from tires to asphalt strengthens the asphalt as well as saves landfill space and reduces fire risk). Researchers are also in the process of developing renewable resources such as the photovoltaic cell (Flavin, 1990; Wald, 1990), wind power (Flavin, 1990), and geothermal power (Flavin, 1990) that have promise for reducing our reliance on fossil fuel.

However, as Oskamp (1983) pointed out, the technologies necessary to reverse environmental problems are extremely expensive and slow to implement. Furthermore, the rates of increase of consumption and pollution have continued to grow. As a result, technological progress in environmental protection does not seem able to keep pace with environmental destruction; the state of the environment appears to be deteriorating as rapidly as ever. As a result, the environment cannot wait for high-tech solutions to ecological problems. People must engage in more pro-environment behaviors.

"Low-Tech" Strategies

In other words, low-tech strategies should be used to decrease environmental destruction. Human behavior -- specifically the high rates of consumption in the developed countries and the high rates of

reproductive behavior of the developing countries -- is largely responsible for environmental problems. In this discussion, only the consumption behavior of developed countries will be addressed. According to the Earth Works Group (1989), the U.S. consumes 50 million tons of paper (i.e., 350 million trees), 28 billion glass jars and bottles, and more than 65 billion aluminum beverage cans per year. In 1986, the average American disposed of 3.6 pounds of garbage per day or over 1,300 pounds of garbage during that year (Wald, 1990). Furthermore, only 10% of wastes generated by the U.S. are currently recycled (U.S. Congress, Office of Technology Assessment, 1989) and rates of involvement in recycling programs are often extremely low. For instance, typically, studies (e.g., Jacobs, Bailey, & Crews, 1984; Spaccarelli, Zolik, & Jason, 1989) found that even when pick-up of recyclables is available at people's own homes (i.e., curbside recycling), only 3% to 15% of the population participated without costly interventions. Similar low recycling rates are found in other settings as well (see below).

While human behavior is largely responsible for environmental destruction, people can act to reverse this destruction. Individuals constantly make decisions in their daily lives that impact the environment. For instance, people can:

1. choose to use public transportation, walk, or carpool instead of driving alone;
2. use coffee mugs instead of styrofoam cups;
3. eat chicken or vegetarian meals instead of beef;
4. choose not to water their lawns;
5. turn the thermostat higher in the summer and lower in the winter;
6. be "Green Consumers¹;"
7. lobby for environmental issues;
8. separate, collect, and transport recyclables;
9. pick up litter; and
10. encourage others to show concern for the environment through their behaviors.

If more people engaged in these behaviors, the environment would benefit tremendously. For example, if 250,000 people (i.e., only 0.1% of U.S. population) recycled just one aluminum can per day, it would save between 1.75 and 3 million gallons of gasoline per year (Earth Works Group, 1989). Similarly, if each commuter car carried one more person each trip (i.e., 2.3 vs. 1.3 people) each day,

1

"Green Consumers" are people who buy products that: are made from recycled products, are in recyclable containers, do not contain chemicals toxic to living tissue and do not contain chlorofluorocarbons, and so on. Furthermore, they try to buy products from companies with a good environmental records.

600,000 gallons of gasoline would be saved and 12 million fewer pounds of carbon dioxide would pollute the atmosphere.

Benefits of Recycling

Recycling provides clear benefits for the environment (e.g., Oskamp, 1983; U.S. Congress, Office of Technology Assessment, 1989). For example, the U.S. Government considers recycling a top priority for the following reasons; it provides:

- 1) . . . conservation benefits compared with incineration and landfilling; and 2) . . . energy savings, at least for some materials such as aluminum, compared with manufacturing using virgin materials. Further, assuming that adequate regulations exist for both primary and secondary manufacturing facilities, recycling may produce fewer pollutants when the entire MSW [municipal solid waste] system is considered (U.S. Congress, Office of Technology Assessment, 1989; p. 9).

As a result of these advantages, the present research developed a recycling program and attempted to increase the target population's participation in the program.

Overview

The introductory chapter of this dissertation contains several sections. The first discusses behavioral intervention strategies that have been used to motivate recycling. Specifically, the

efficacies of prompts, "rejection-then-retreat," indebtedness, assigned intervention agents, convenience, goals, feedback, and rewards are reviewed.

The second section comments briefly on setting characteristics and the benefits of conducting a recycling program in a corporate setting. In the third section, the importance of identifying person variables that influence engagement in pro-environment behavior is discussed. It is hoped that an understanding of person variables will help future program planners create interventions that are cost-effective by tailoring interventions to match specific segments of the population. The person variables explored include expectancies, subjective values of outcomes, and encoding -- three of five classes of variables considered by social cognitive theorists to play a major role in determining behavior. The fourth and fifth sections of the introduction discuss the goals and hypotheses of the current research, and the sixth section describes the preliminary research accomplished for this project. The second through fourth chapters of the dissertation consist of methods, results, and discussion, respectively.

Behavioral Intervention Strategies Used to Motivate Recycling

Since human behavior is largely responsible for the unhealthy state of the environment and since there are many opportunities for people to engage in pro-environment behaviors, motivating people to

behave in a more environmentally friendly fashion could be a very effective approach toward environmental protection. Legislation represents one type of behavior change approach for preserving the environment. Laws have targeted the environmentally-related behavior of nations, industries, and individual citizens. For example, in the 1970's, the U.S. banned the use of chlorofluorocarbons (CFCs) in aerosol cans (Flavin, 1990); nine states have initiated container deposit laws (U.S. Congress, Office of Technology Assessment, 1989); some localities mandate participation in curbside recycling programs; and some California communities have laws that limit water use.

Laws have produced mixed results in environmental protection and most other problems. On the one hand, laws that require bottle manufacturers to give a refund for returned bottles typically result in 70% to 90% redemption rates (U.S. Congress, Office of Technology Assessment, 1989). Similarly, the Clean Air Act's requirement to use lead-free gasoline resulted in dramatic decreases in atmospheric lead levels (Caplan, 1990). Finally, a mandatory recycling program in Woodbury, New Jersey has achieved a mean weekly participation rate of 98% by spot checking homes' compliance and distributing fines of up to \$300 for violations (Grogan & Bell, 1989). On the other hand, laws often do not affect the behavior of a sizable portion of the population. For example, mandatory recycling programs have sometimes resulted in residence participation rates as low as 40% (Nielsen &

Ellington, 1983). (Similarly, in the field of traffic safety, states that have enacted mandatory safety belt use laws rarely have obtained sustained belt-use rates above 50% [Williams & Lund, 1988]).

In addition to the large proportion of people not influenced by laws, there are several drawbacks to mandating pro-environment behavior, making the exploration of non-legislative strategies important. First, mandates may be interpreted as limiting citizens' first amendment rights. Second, limiting freedoms by mandating people to behave pro-environmentally may be counterproductive. According to Brehm and Brehm (1981), people tend to react against perceived threats to their freedom by acting in opposition to the perceived coercion. As a result, people may attempt to undermine pro-environment laws (i.e., litter when no one is looking; place a single item in their recycling container and throw their other recyclables in the garbage). In addition, people may be less likely in the future to vote for candidates and issues that protect the environment. Third, in order to be effective, laws often require extensive education programs as well as expensive and complicated monitoring and enforcement procedures. Fourth, the monitoring procedures may be considered by many to be a violation of the right to privacy.

Another reason for studying behavioral strategies for increasing recycling behavior is that, despite the disadvantages, lawmakers are

likely to continue to pass pro-environment legislation. Since laws depend on communication and consequence strategies (i.e., usually threats and penalties but sometimes incentives and rewards), the efficacy of laws could be enhanced if lawmakers consider the findings of behavioral scientists who are experts on influencing behavior in general and on motivating people to recycle in particular.

A variety of behavioral interventions have been used by behavioral scientists to motivate recycling (e.g., Burn & Oskamp, 1986; Couch, Garber, & Karpus, 1978-1979; Davidson-Cummings, 1977; Geller, Chaffee, & Ingram, 1975; Hamad, C., Bettinger, R., Cooper, D., & Semb, 1979; Hamad, Cooper, & Semb, 1977; Humphrey, Bord, Hammond, & Mann, 1977; Jacobs et al., 1984; Katzev, & Pardini, 1987-1988; Luyben & Bailey, 1979; Luyben, Warren, & Tallman, 1979-1980; McCaul & Kopp, 1982; Reid, Luyben, Rawers, & Bailey, 1976; Spaccarelli et al., 1989-1990; Witmer & Geller, 1976). See also reviews by Cone and Hayes (1980) and Geller, Winett, and Everett (1982).

Behavior change strategies can be divided into antecedents and consequences, those that come before and those that come after the target behavior. The antecedent strategies used in the recycling literature include: prompts, indigenous intervention agents, pledge cards, convenience, "foot-in-the-door," and goals. Rewards and feedback are the consequence strategies that have been used. In this

section, the use of these intervention strategies and their effectiveness in promoting recycling will be described.

Antecedents

Prompts

Written Prompts.

Written and oral prompts are strategies often used to encourage participation in recycling programs. Prompts can be delivered to many people simultaneously. For example, newspaper ads and public service announcements can simultaneously inform many people about a recycling program. In addition, prompts can be directed to single individuals. For example, they can be hand-delivered to dormitory residents (Ingram & Geller, 1975). Nearly every recycling intervention has used at least one, and sometimes repeated prompts in order to inform, remind, and/or persuade the target population to collect recyclables.

Geller and his students (Geller et al., 1975; Ingram & Geller, 1975; Witmer & Geller, 1976) studied the effects of written prompts on newspaper recycling in college dormitories. Prompts in each of these studies used messages similar or identical to the following:

****RECYCLE PAPER****

YOU CAN HELP TO:

PRESERVE OUR NATURAL RESOURCES

PROTECT THE ENVIRONMENT

SAVE TREES

ALLEVIATE THE PAPER SHORTAGE

BRING ALL PAPER (INCLUDING THIS
SHEET) TO COLLECTION ROOM ON
FIRST FLOOR MONDAY - FRIDAY
5:30 - 7:30 p.m.

Geller et al. (1975) found that when they used prompting posters 2.2% of residents participated in the program. In other studies in the same setting, Geller and his students (Ingram & Geller, 1975; Witmer and Geller, 1976) placed prompting flyers under each resident's door, resulting in 2.6% and 2.9% participation, respectively. Finally, Ingram and Geller (1975) found that personally delivering flyers to residents resulted in 4.3% participation.

In a community curbside recycling program collecting newspapers and aluminum cans, Jacobs et al. (1984) found approximately 3% participation in a community recycling program with promotion by newspaper ads, but when residents later received a single brochure in addition to the newspaper ads, approximately 8% of the households participated. Thus, newspaper ads tend to be less effective at

soliciting participation than a flyer distributed to each resident. Perhaps, this is because it is easier to ignore or overlook one of many advertisements in a newspaper than to overlook a brochure that is in one's mail. While a newspaper ad usually does not require the reader to take any action, a flyer requires at the least a decision regarding whether to read it or throw it away.

In another community study, Spaccarelli et al. (1990) investigated the effects of giving residents two brochures that emphasized the ease and importance of curbside recycling. Unfortunately, the authors did not present the exact content of the brochures in their paper. Results indicated that the brochures increased participation to 5.5% per week from 3.2% per week at baseline.

Burn and Oskamp (1986) studied the effects of a written prompt that made use of the social psychological research on persuasion. Specifically, the appeal contained normative information, accepted beliefs and practices, moderate fear, and specific response information. The message contained the following statements:

CLAREMONT IS RECYCLING. Recycling makes a difference and recycling is happening. Over 80% of Claremonters favor the City's recycling program, and other cities are calling to ask us how Claremont does it . . . Californians alone produce some 40 million tons of refuse a year --enough to fill a two-lane

highway, 10 feet deep from Oregon to the Mexican Border.

Currently, the average person in the United States produces about 1,300 lbs. of municipal solid waste a year. Most of this trash goes into landfills, and it is estimated that if present trends continue, nearly all of Los Angeles County will be without refuse disposal capacity by 1991 (only 8 years away) . . . RECYCLING IS EASY

. . . SIMPLY PUT NEWSPAPER, ALUMINUM, AND GLASS INTO SEPARATE BAGS AND PLACE AT THE CURB ON YOUR REGULAR TRASH COLLECTION DAY.

Results indicated that during the intervention, 15% of households in the prompt/appeal group and 2.8% of control households participated in the curbside program.

Verbal Prompts.

In an elementary school setting, Hamad et al. (1977) found in-class verbal prompts to result in approximately 1 lb of paper per student per week. Unfortunately, the authors did not specify the frequency of verbal prompts distributed during this time, nor did they report the percentage of students who participated.

Combination of Written and Verbal Prompts.

Spaccarelli et al. (1990) found that when verbal prompts and brochures were given to homeowners, weekly participation in a curbside recycling program more than doubled, from 4.3% at baseline to 9.0% after the intervention.

In sum, these studies suggest that written and oral prompts tend to increase low baseline participation in recycling programs. However, prompts seem to be most effective when they are either carefully constructed appeal messages or when the prompts are delivered to the target population in both written and verbal form.

"Foot-in-the-Door" Technique

The "foot-in-the-door" technique involves making an initial small request, followed by a larger request (Cialdini, 1988). Several authors (e.g., Cann, Sherman, & Elkes, 1975; Freedman & Fraser, 1966; Sharkin, Mahalik, & Claiborn, 1989) found that compliance with a small initial request increased the probability that people will comply with a larger request than control groups who did not receive an initial request.

In the recycling literature, only one study (Arbuthnot, Tedeschi, Wayner, Turner, Kressel, & Rush, 1976-1977) was found that used the "foot-in-the-door" technique. In this study, subjects received between zero and three initial requests. The three requests included filling out a recycling survey, saving cans for recycling for one week, and mailing a postcard (provided) to city representatives asking them to expand the city's recycling program. The only dependent variable was self-reported use of the city's recycling center and was assessed in a telephone interview that inquired about participation in a variety of community activities including

recycling. Households initially recycling were eliminated from the analyses so as not to inflate compliance rates artificially. Results indicated that the more requests a person received and complied with, the more likely s/he was to report subsequent first-time use of the city's recycling center. Of residents who either received and complied with the appeal plus the letter or all three requests, 80% or more reported using the city's recycling center as compared with 20% or 32% of residents in the survey plus letter and survey plus appeal conditions, respectively; and 10% or fewer participated from conditions in which only one request was made and complied with. This pattern of differences was still apparent at an 18 month follow-up. Unfortunately, two characteristics of the study confound the results. First, the dependent measure was self-reported recycling which may be susceptible to social desirability bias. Second, the measures were correlational, rendering it inappropriate to make inferences regarding cause-and-effect.

While no other studies were found that investigated the efficacy of the "foot-in-the-door" technique on recycling behaviors, Katzev and Johnson (1984) examined the effects of the technique on energy conservation. While recycling and conservation behaviors have several important differences, their similarities suggest it may be worthwhile to consider conservation studies using a particular intervention strategy when relevant recycling studies are not

available. One difference between the two activities is that energy conservation saves money (i.e., provides an incentive and is reinforcing), whereas recycling often does not result in financial gain for the participant. A second important difference is participation has different response costs. Unlike recycling, energy conservation may affect a person's physical comfort (e.g., skin temperature) but not require much time (it takes only a few seconds to turn down the thermostat). In contrast, recycling is unlikely to cause physical discomfort but has other costs; it requires time for preparing and transporting the recyclables (e.g., rinsing glass, crushing cans, driving recyclables to a collection center), recyclables require storage space, recyclables may be unsightly, and if recyclers are not careful, recyclables may smell or attract insects. Both types of environmentally-protective behaviors are similar in that they may often be altruistically motivated -- motivated by concern for the collective whole despite personal costs (Nielsen & Ellington, 1983). Similarly, both behaviors often reflect a concern for nature and the environment.

In the Katzev and Johnson (1984) study, households were included if they agreed to have their electricity meters read. The control group received no further communication from the experimenters, whereas households in the "foot-in-the-door" condition were asked to answer seven brief questions about energy conservation. All subjects

in the "foot-in-the-door" condition complied with this initial request. Results indicated that the "foot-in-the-door" and control groups did not differ reliably with respect to percentage of change in energy consumption between the baseline and the conservation phases. Perhaps the failure to find a difference between these groups reflects the fact that the control group did receive an initial small request (i.e., to allow their meters to be read). Thus, the "control" group was in fact a "foot-in-the-door" group, too.

In sum, the "foot-in-the-door" technique warrants further investigation in the area of increasing participation in recycling programs.

"Rejection-then-Retreat" Technique

Although the "foot-in-the-door" technique is predicated on subjects complying with an initial small request, even rejection of an initial request can be associated with increased compliance with a subsequent request, if the subsequent request is made immediately after the first request was rejected.

According to Cialdini (1988),

. . . [people generally believe that] a person who acts in a certain way toward us is entitled to a similar return action . . .
[people feel] an obligation to make a concession to someone who has made a concession to us (p. 39).

When a person refuses an initial request, the person making the request can be viewed as retreating. As a result, when the latter person makes a second request, the first person may feel obligated to retreat by complying with the second request. This is known as the "Rejection-then-Retreat" or "Door-in-the-Face" Approach (Cialdini, 1988). Cann et al. (1975) performed a study that lent support to this position. They used a 2 X 2 factorial design in which they varied the size of an initial request (small vs. large) with the timing of a second, moderate-size request (no delay vs. 7-10 day delay). The initial, small-size request was to answer a brief phone interview pertaining to traffic safety. The initial, large-size request was to spend two hours watching and recording traffic patterns. The subsequent, medium-size request was to distribute 15 traffic-safety pamphlets to their neighbors. The authors also included a control group that only received the medium-size request. The size manipulation was successful -- all of the participants in the initial, small-size request condition complied with the small-sized request whereas only 24% of those in the initial, large-size request condition complied with the large-size request.

Results indicated that 78% of the small-request-no-delay group, 70% of the small-request-delay group, 90% of the large-request-no-delay group, 29% of the large-request-delay group, and 50% of the control group complied with the second, medium-sized request.

Compared to the control group, each experimental group exhibited a reliably different rate of compliance with the second request. The two small-initial-request groups had reliably higher compliance rates to the second request than the control group (represents a "foot-in-the-door" effect). Conversely, the group receiving the large initial request followed by a delayed second request demonstrated reliably lower compliance rates with the second request than the control group. Both of these findings are consistent with Bem's self-perception theory (1972) which states that people look to their own behavior to know their attitudes, values, and beliefs. Thus, people's response to an initial request may influence their self-perceptions which in turn increases the likelihood that they will respond in a similar fashion to a subsequent request, especially when the two requests involve similar topics.

Finally, the group that received the large initial request (rejected by most subjects) followed immediately by the second request had a reliably higher compliance rate than the control group, showing a "Rejection-then-Retreat" Effect.

In conclusion, an experimenter could increase his/her odds of obtaining compliance with a request by making a small initial request followed immediately by the request of interest. If the subject complies with the initial request, s/he is likely to comply with the second request due to self-attributions, and if s/he does not comply

with the initial request, s/he may feel obligated to retreat by complying with the second request.

Indebtedness Technique

It is well known that people who receive presents, favors, or invitations tend to feel a strong obligation to reciprocate. Cialdini (1988) cites evidence that suggests that indebtedness is overpowering. More specifically, recipients' reciprocation occurs at high rates even when they do not like the requestor and even when they do not value the present, favor, or invitation. In addition, after giving a small favor, the requestor generally may choose the nature and to some extent the size of the debt-cancelling favor. As a result, people can use indebtedness to obtain unfair exchanges to their advantage. A case in point is the remarkable success the Hare Krishna organization has had obtaining monetary donations in exchange for flowers and books (Cialdini, 1988).

Indigenous Intervention Agent

Indigenous intervention agents may be defined as people who attempt to motivate others to engage in pro-environment behaviors. Nielsen and Ellington (1983) examined the effects of volunteer block leaders (indigenous intervention agents) on participation in a curbside program. The volunteer block leaders were members of a grass-roots organization designed to increase participation in the city's recycling efforts who volunteered to attempt to persuade their

neighbors to participate. Results indicated that blocks with leaders (n=2844) were reliably more likely to use the curbside service than blocks without block leaders (n=16,055) -- 26.5% with block leaders participated versus 11.5% without block leaders. Unfortunately, the authors did not use rate of participation during baseline as a covariate. It is quite possible that blocks with block leaders had higher participation rates prior to the campaign because the future block leaders were already participating.

Hopper and Nielsen (1991) performed a follow-up study that used indigenous intervention agents to increase participation in a curbside recycling program. They compared participation of blocks that received the following interventions: solicitation by volunteer block leaders (n=21), solicitation by recruited block leaders (n=46), monthly prompts by the experimenters (n=37), brochures at the beginning and midway (i.e., after 3 months) through the program (n=37), and a control group that received no intervention (n=26). Recruited block leaders were persons who were recruited by the experimenter to promote recycling. The authors calculated the frequency of participation at posttest and the change in frequency of participation between pretest and posttest. The post-test measure indicated that the blocks differed reliably from each other in at least two of the conditions. The blocks with volunteer block leaders had the highest mean, followed by the blocks with recruited block

leaders, blocks that received monthly prompts by the experimenters, blocks that received two brochures, and the control blocks. Unfortunately, post hoc pair-wise comparisons were not reported.

For each of the experimental groups, the intra-group changes in participation rates increased reliably, whereas the control group did not exhibit a reliable change from pretest to posttest. In addition, inter-group differences in the change in number of times a residence participated between pretest and posttest suggested that at least two of the groups differed reliably from each other. The blocks with recruited block leaders exhibited the largest increase in participation, followed by the blocks receiving monthly prompts from the experimenter, blocks with volunteer block leaders, blocks receiving two brochures, and the control blocks. Again, pair-wise comparisons were not reported. The change from pretest to posttest for blocks with volunteer block leaders was probably not higher than other blocks since the participation rates of the former were already high initially (perhaps near a ceiling). Furthermore, the volunteer block leaders were not contacted by the experimenters and therefore were unlikely to have changed their behavior when the intervention phase began.

Like the above studies, Burn (1991) found that recruited block leaders were more effective than experimenters at motivating neighbors to participate in a recycling program. The author had two

experimental groups and one control group. In the block leader group (n=41), households that participated in the curbside program at least once during a four week baseline were approached and asked to distribute recycling bags and a written appeal to their neighbors, and to attempt to persuade their neighbors verbally to participate in the program. In the other experimental group (n=68), the author delivered recycling bags and the written appeal message to each household in the group. In the control condition (n=102), households were not contacted in any way by the researcher. Participation was observed in each household for the 10 weeks following the interventions. Results indicated that the block leader group had a reliably higher participation rate than the experimenter-contacted group who in turn had a reliably higher participation rate than controls. The weekly mean percentage of homes participating in each group were 28%, 12%, and 3%, respectively. Interestingly, the treatment effects did not deteriorate over the course of the 10 weeks after these interventions were performed.

In sum, indigenous intervention agents have been shown to increase participation markedly in curbside recycling programs. Perhaps, indigenous intervention agents are effective because they serve as more similar and more convincing role models to a target population than would the experimenters. In addition, the effort exerted by these indigenous intervention agents may increase their

own commitment to pro-environment behaviors (Geller, Needleman, & Randall, 1990).

Convenience

Convenience may be defined as anything that makes performing a behavior less difficult or punishing to an individual (i.e., a factor that reduces response cost). Therefore, anything likely to increase convenience, such as the proximity of collection sites, the availability of containers to make separation or storage of recyclables easier, and convenient temporal characteristics of pick-up or delivery of recyclables is likely to increase people's recycling behavior.

Five studies (Davidson-Cummings, 1977; Humphrey, Bord, Hammond, & Mann, 1977; Luyben et al., 1979-1980; Reid et al., 1976; Witmer & Geller, 1976) examined the effects of proximity of containers on participation in recycling programs. Unfortunately, in Luyben et al. (1979-1980) and Reid et al. (1976), the introduction of more recycling containers occurred simultaneously with an increase in prompting, thereby making it impossible to determine the relative effects of each. In both of these studies, the intervention package resulted in clear increases in weight of recyclables.

In the other three studies, the independent role of spatial proximity on participation in recycling programs was examined. Davidson-Cummings (1977) studied a Coca Cola sponsored recycling

program involving thousands of subjects in three states. She found a large negative correlation ($r = -0.69$) between the number of participants in a recycling program and the distance from participants' homes. Humphrey et al. (1977), in an office setting, measured the mean percentage of salvageable wastepaper placed in storage containers as a function of the employees' proximity to the containers. They found a non-reliable trend for employees to salvage more wastepaper if they could put it in containers near their desks than if they had to bring it to a container in a centralized location in the office. In a college dormitory setting, Witmer and Geller (1976) found proximity to have a positive effect on collection of recyclables. Specifically, students living on floors closer to a recycling receptacle (i.e., basement) were reliably more likely to participate in the program than those living farther away. (Unfortunately, no values of differential participation were reported.) Thus, the studies that examined the independent effect of spatial proximity on participation in recycling programs suggested that there may be a relationship between the two variables.

Another type of convenience that might affect participation is the ease with which materials can be prepared and stored in one's home. Jacobs et al. (1984) found that households receiving containers with separate compartments for newspaper, aluminum and garbage ($n=36$) dramatically increased percent participation in a

curbside recycling program (i.e., from about 10% to 25%), whereas households not receiving special containers (n=40) did not increase percent participation. Interestingly, when twice-a-week written prompts were distributed, households with separation containers increased their participation further, whereas participation for households without containers did not increase. This suggests that prompts and other types of interventions may interact to increase recycling more than either would alone.

A third type of convenience is related to the pick-up schedules of recyclables and household garbage. Jacobs et al. (1984) studied the effect of having recyclables and garbage picked up from households on the same day versus collection on different days. Prior to the start of a curbside recycling program, some houses (n=275) in a neighborhood had garbage pick-up on Mondays and Thursdays, while the others (n=369) had garbage pick-up on Tuesdays and Fridays. Therefore, when curbside recycling began on Tuesdays for the whole neighborhood, some households had the opportunity to place garbage and recyclables out on the same day (i.e., more convenient), whereas the others did not (i.e., less convenient). (The authors noted that since households could not be randomly assigned to same-day or different-day pick-up, the groups may be nonequivalent in some way. However, the groups were not reliably different with respect to geographic location, values of the homes,

and housing diversity.) Results indicated that those who had pick-up on the same day participated reliably more often than those who had pick-up on different days. More specifically, approximately 14% of those who had same-day pick-up participated each week, whereas approximately 7% of those who had different-day pick-up participated each week.

In sum, these studies suggest that convenience often dramatically increases participation in recycling programs.

Goals

According to Bandura & Cervone (1983), "the evidence is relatively consistent in showing that explicit challenging goals enhance performance motivation . . . [by providing] the standard against which performance is gauged." Only one study in the recycling literature was found that used goals without feedback or other interventions to increase the collection of recyclables. McCaul and Kipp (1982) found that college students who were assigned recycling goals collected reliably more recyclables than students not given goals. Specifically, students who were asked to collect four beverage cans per day for two weeks (n=55) collected more cans than students who were told simply to collect cans for two weeks (n=65). On average, students from the goal group collected a mean of 45 cans in two weeks, whereas the No Goal group collected a mean of 28 cans, a 61% difference.

In conclusion, this section on antecedent strategies to increase participation in recycling programs revealed that although several types of antecedent strategies have increased participation in recycling programs, researchers have consistently found that a large proportion of targeted populations was unaffected by the interventions.

Consequences

Feedback

Two types of consequence strategies have been used to promote recycling -- feedback and rewards. With many target behaviors, settings, and populations, feedback, especially in conjunction with goal-setting, has been shown to be an effective strategy for promoting beneficial behavior change (Bandura & Cervone, 1983; Bandura & Wood, 1989; Mischel, 1986; Van Houten, Nau, & Marini, 1980; Wood & Bandura, 1989). Hamad et al. (1979) used feedback to increase participation in an elementary-school newspaper recycling program. In this study, a poster showing the amount of paper each class collected was displayed in the school's main hallway. Results indicated a 33% decrease in the amount of paper collected during the feedback condition, with only 2% of the students participating. Geller et al. (1982) suggested that this surprising finding may have resulted from a dissipation of novelty of the recycling program or from students' failure to attend to the feedback chart due to a lack

of contingencies for doing so (i.e., no incentives were given to students for increasing their recycling behavior).

A second study (Goldenhar, 1990) used feedback to motivate delivery of recyclable newspaper in college dormitories. During the five-month intervention, posters providing both intra-building and inter-building feedback were displayed in each dormitory and updated on a monthly basis. An analysis of covariance was performed with pre-intervention pounds of paper per resident as the covariate. The analysis revealed that the buildings receiving feedback (n=648 residents) did not collect reliably more newspaper per resident than control buildings (n=386 residents). These two studies suggest that feedback without goals is not effective at motivating delivery of newspaper for recycling.

Goals Plus Feedback

Many researchers have combined goals and feedback and found the combined treatment to be more effective than either individually. No studies were found that used feedback plus assigned goals to increase participation in recycling programs. However, Hamad et al. (1977) used goals plus incentives. Presumably, incentives are effective because they cause people to make personal goals of attaining the promised (desirable) reward; for many people, the personal goal is likely to include performance goals for attaining the reward. The authors studied the effect of a contest and feedback on newspaper

collection in elementary schools (N=271). Hamburgers were given to students who brought newspapers to school for recycling and belonged to the classroom with the highest rate of delivery of paper per student in a week. During the experimental condition, students were given weekly feedback regarding the weight of newspaper collected by each classroom. The authors used a B-A-B-A experimental design in which the first and third intervention phases ("B"s) were the contests plus feedback, and the second and fourth phases ("A"s) were prompts. Results indicated that during the intervention phases, 14,298 pounds of newspaper were collected and in the prompt condition 792 pounds were collected, indicating that the contests plus feedback conditions yielded 1705% greater weight of newspaper than the prompt conditions. In addition, approximately 50% of the students participated at least once during the intervention phases.

Several possible explanations can be given for the huge increase in recycling over baseline. First, feedback tends to be most effective when subjects are already motivated to perform the target behavior or have some type of external motivation for doing so (Bellack & Hersen, 1985). Second, unlike other studies that used incentives and rewards (reviewed below), there were both group and individual contingencies for participating in the program. Third, the rewards (i.e., hamburgers) might have been particularly salient for children, the target population. Fourth, contests may be more

effective for motivating children than adults. For example, the prospect of incurring social censure for being left out when one's classmates are getting rewards from a contest might have been particularly motivating. Fifth, parents may have encouraged and helped their children deliver recyclables because the parents did not want their children to be embarrassed if the children's class won and their children had not participated. It is not possible to determine which if any of these factors best explain the unusually large increase in recycling as a result of this program.

While no other studies were found that investigated the efficacy of goals plus feedback on recycling behaviors, some studies examined the effects of goals plus feedback on energy conservation. Becker (1978) randomly assigned households into the cells of a 2 X 2 factorial design in which they varied feedback (no feedback vs. feedback) and goal difficulty (easy vs. difficult). A control group received no goals or feedback. Every Monday, Wednesday, and Friday of the study, households in both feedback groups received personal feedback messages regarding their energy consumption. The messages were posted on the outside of their windows facing toward the inside. Easy goals requested that households reduce their daily energy use by 2%, and difficult goals requested a 20% reduction. Energy use during the treatment condition was calculated with pre-treatment consumption as a covariate. After the intervention, only the group assigned the

difficult goal and given feedback, exhibited reliably lower levels of energy consumption than the control group. After adjusting for pre-intervention energy consumption, the feedback plus difficult goal group consumed a mean of 34.7 kilowatt hours and the control group consumed 39.9 kilowatt hours (i.e., a 15% difference).

Winett, Hatcher, Fort, Leckliter, Love, Riley, and Fishback (1982; Experiment 2) gave individual daily feedback regarding electricity consumption to two groups of households during summer months and requested that these households reduce their energy consumption by 15% -- the groups differed with respect to whether they saw a videotape that modeled energy conserving behaviors. In addition, these households were asked to commit to the goal by signing a pledge card. Analysis of covariance indicated that the goal-plus-feedback groups conserved more energy than a control group. The difference between the feedback groups and the control group was approximately 10%.

In summary, feedback alone was not effective at motivating people to act in a pro-environment fashion. The one study that used goals alone demonstrated a marked increase in the collection of recyclables. Whereas the studies that used goals plus feedback to motivate energy conservation resulted in modest changes in the desired direction, the study that used goals plus feedback and

targeted collection of recyclables resulted in a dramatic increase in the pounds of recyclables collected.

Rewards

Individual Rewards.

Researchers have used both individual and group rewards for motivating participation in recycling programs, and they have used a variety of reward strategies, including paying participants for recyclables, giving tokens which provided discounts on local merchandise, raffles, and contests. Many of these studies will be reviewed in this section.

Davidson-Cummings (1977) found that when a Coca Cola recycling center in Connecticut stopped paying individuals for recyclables, the number of recyclers decreased from approximately 500 to 100 per week. No such decreases were seen in New York or New Jersey's Coca Cola programs in which monetary reimbursement was on-going.

Katzev and Pardini (1987-1988) examined the recycling behavior of individual households receiving tokens redeemable for discounts on locally sold merchandise. The authors found that the group receiving the tokens participated reliably more frequently than the control group. The token group (n=14) took advantage of 34.3% of their opportunities to leave materials, whereas the control group (n=15) only took advantage of 16% of their opportunities. In addition, the token group collected a reliably greater weight of paper than did the

controls, 378 lbs versus 145 lbs. During the last three weeks of the study, when tokens were no longer available to the token group, the differences between the token and control groups disappeared.

Luyben and Bailey (1979) investigated the use of prizes to motivate individual children to deliver paper for recycling at two trailer parks. Children who participated could choose a toy within a particular price range. The price range was determined by the amount of paper they delivered. The authors found an 154% increase in the weight of the paper collected at one park (baseline = 242 lbs) and a 60% increase at the other (baseline = 132 lbs).

Several studies (Couch et al., 1978-1979; Geller et al., 1975; Ingram & Geller, 1975; Witmer & Geller, 1976) used raffles to motivate individuals to collect recyclables. Each of the studies using raffles (i.e., Couch et al., 1978-1979; Geller et al., 1975; Ingram & Geller, 1975; Witmer & Geller, 1976) was conducted in college dormitories and targeted delivery of paper to a collection room. In each of these studies, the raffle condition was more effective than antecedent strategies at motivating program participation (i.e., the percentage of residents who participated and the weight of materials collected during raffle conditions were higher than in the other antecedent conditions). For example, in Geller et al. (1975), 141 pounds of paper were collected per week in the prompt condition versus 253 pounds in the raffle condition. With

respect to percent participation, 2.2% participated during the prompt condition versus 7.3% during the raffle condition. Similar results were obtained by Couch et al. (1978-1979), Ingram and Geller (1975), and Witmer and Geller (1976).

Group Rewards.

In addition to studies that gave rewards to individuals for engaging in recycling behaviors, three studies (Geller et al., 1975; Hamad et al., 1979; Witmer & Geller, 1975) provided group rewards for recycling behavior. Each of these studies found contests to increase the quantity of recyclables and the number of deliveries of recyclables. For example, Geller et al. (1975) conducted contests in college dormitories in which the dorm collecting the most paper per resident each week received \$15 for its dorm fund. The researchers found the contests to increase the percentage of participants from 2.2% during the prompt condition to 3.9% during the contest, and the weekly weight of paper collected during the prompt condition increased from 141 pounds to 237 pounds during the contest condition.

Comparative Efficacy of Reward Strategies.

Geller et al. (1975) and Witmer and Geller (1975) compared raffle and contest conditions. Results of both studies suggested that a greater number of participants and greater weight of paper were collected during raffle conditions than during contests. Specifically, in the former study, 7.3% of residents participated in

the raffle and 3.9% participated in the contest; and 253 lbs per week were collected in the raffle and 237 lbs per week were collected during the contest. Similarly, in Witmer and Geller, 12.2% of residents participated during the raffle phase and 5.9% participated during the contest, and 820 lbs per week were collected during the raffle, whereas only 544 lbs were collected during the contest².

In summary, rewards often dramatically increased participation in recycling programs over low baseline levels. However, the proportion of eligible subjects participating during these programs was typically quite low.

Conclusions Regarding Behavioral Intervention Strategies

Several intervention techniques, including indigenous intervention agents, convenience, and rewards have been shown to increase markedly the preparation and transportation of recyclables. Other techniques, such as appeals, "foot-in-the-door," "rejection-then-retreat," and goals plus feedback, show promise for motivating people to participate in recycling programs. Unfortunately, even techniques that have dramatically increased participation in

²The smaller raffle-contest weight difference in Geller et al. (1977) than Witmer and Geller (1975) was probably due to the relatively lenient criteria for obtaining raffle tickets in the first study -- a ticket was earned for any visit to the collection room, including deliveries of a single sheet of paper.

recycling programs have only gotten a small proportion of the target population to perform the behavior.

Setting

Table 1 suggests several potential advantages of corporate-based recycling programs. For example, a corporate based program might: (a) be highly efficient; (b) provide benefits to the company, to the community, and to the study of environmental behavior; and (c) provide indirect benefits (as well as direct benefits) to the environment³.

³While the author is suggesting there are benefits of conducting recycling programs in corporate settings, it is not without the realization that industry has played an integral role in creating environmental problems. Not only has it responded to consumers' demands for convenient environmentally-destructive products, but it spends billions of dollars per year encouraging consumption and contributing to our society's "throw away" mentality.

Many companies are quick to pay lip service to environmental conservation and promote themselves as "environmentally friendly" while continuing to engage in behavior that is grossly destructive to the environment. As a result, the author believes it is important that researchers only work with (and provide media attention for) companies that have a good environmental record or are demonstrating that they are beginning to act in a more environmentally friendly fashion.

Table 1. Potential Advantage of a Corporate-Based Recycling Program.

I. Efficiency

*Efficient and convenient modes of communication are often available in companies that are not available in a residential setting.

*Workers are a "captive" audience for various persuasion and behavior change strategies.

II. Benefits to the Company

*Corporations can reap public relations benefits by sponsoring a recycling program.

*Many conservation strategies can save corporations money by making them more efficient.

*In anticipation of mandates that will require companies to comply with certain environmental standards, companies might engage voluntarily in pro-environment programs in order to make a gradual and controlled change that is relatively non-disruptive. In addition, they can capitalize on an opportunity to establish goodwill that would be lost if they waited for a mandate (Mobil Oil, 1990).

III. Benefits to the Community

*Successful recycling projects in the community delay the need to replace landfills or build incinerators.

*Communities can reap public relations benefits by sponsoring a corporate-based recycling program.

*Community members may feel "empowered" by the project and be more likely to participate in other pro-societal projects.

Table 1. (continued)

IV. Benefits to the Study of Environmental Behavior

*Companies are ideal settings for using state-of-the-art applied behavior analysis strategies. For example, the individual behavior of employees can be observed, and questionnaires could be completed by employees. These procedures would allow researchers to study patterns of pro-environment behavior as compared to gross outcome measures which give little information about how individual employees are behaving. In addition, they allow researchers to study individual differences between recyclers and non-recyclers, and between intervention responders and non-responders.

V. Indirect Benefits to the Environment

*Public relations media campaigns would disseminate pro-environment values to the community.

*The corporate culture could change in favor of recycling and lead to innovative recycling or source reduction strategies for the industry itself.

Electronic and Phone Mail as Intervention Tools

Most notable among the efficient and convenient modes of communication referred to in Table 1 are electronic mail (e-mail) and phone mail. Both e-mail and phone mail permit program planners to: (a) use minimal resources to disseminate a program-related motivational message; (b) disseminate the same message to hundreds of employees simultaneously; or (c) communicate with individual employees, thereby eliminating the need to hold work-disrupting, time-consuming meetings with employees. Furthermore, they allow employees to read or hear messages at a convenient time as opposed to being interrupted by a phone call; they provide an easy way for a program planner to remind employees of a particular program on a regular basis; and they often fit the existing culture of the company, increasing the likelihood that such a program might continue indefinitely. In sum, e-mail and phone mail have the potential of being an extremely efficient, versatile, and low-cost method of disseminating program information and influencing behavior change.

Although researchers (Adrianson & Jhelmqvist, 1988; Garramone, Harris, & Pizante, 1986; Huff, Sproull, & Kiesler, 1989; Kiesler, Siegel, & McGuire, 1984; Rice & Love, 1987; Schaefermeyer & Sewell, 1988; Siegel, Dubrovsky, Kiesler, & McGuire, 1986) have studied e-mail with respect to several aspects of corporate functioning (e.g., e-mail use and organizational commitment; how groups having computer-

mediated meetings vs. traditional meetings come to consensus; perceived status of participants in face-to-face vs. e-mail conferences; emotional content in e-mail communications), the author found no studies that evaluated the use of e-mail as a conduit for delivery of interventions in a corporate setting.

One study (Walker, 1987), however, used computer bulletin boards (CBB) as a means to disseminate a stress management intervention to individuals who were interested in receiving it. One group received traditional face-to-face stress management training, while another group received training via a CBB. In the CBB group, subjects exchanged messages with a therapist and interacted with automated system functions. The functions included cognitive/behavioral assessment, self-monitoring progress in applying specific and general stress reduction strategies, and instantaneous graphic and written feedback on progress. Results indicated that the CBB intervention was as effective as the face-to-face intervention. In addition, after the initial development of the software, the CBB intervention was more cost-effective than the face-to-face intervention.

While these results are promising, they may not generalize to pro-environment interventions. Participants in the Walker (1987) study volunteered for the program and presumably felt that they had a problem for which they wanted help. In contrast, a corporate-based recycling program would attempt to solicit behavior from all

employees, regardless of their motivation to be involved. Nonetheless, a corporate-based, e-mail mediated recycling program could be cost-effective and is worth evaluating.

**Social Marketing: Matching Person Variables
and Intervention Characteristics**

In addition to intervention and setting characteristics, individual differences may influence responsiveness to behavior change interventions as well as baseline levels of program participation. Indeed, the failure of many of the reviewed studies to increase recycling behavior among a large percentage of the individuals targeted may be partly due to the fact that researchers typically administer an intervention package to heterogeneous populations and ignore important individual differences. According to Winett, Altman, and King (1989) ". . . the idea that 'magic bullet,' packaged, off-the-shelf interventions can be designed to work with very diverse population segments is largely fallacious" (p. 16). Florin and Wandersman (1984) concur and suggest that researchers investigate the person variables differentiating program participants from non-participants in a given situation.

The concept of matching individuals with intervention techniques is a key element of social marketing. According to the social marketing approach, a population can be "segmented" into submarkets.

Ideally, submarkets should be homogenous with respect to some characteristic relevant to responsiveness to a specific intervention (Geller, 1989). As a result, interventions can be carefully "tailored" to a particular "submarket" in order to maximize intervention gains. The social marketing paradigm assumes that population segmentation and intervention tailoring based on careful market analysis should increase the percentage of people who respond appropriately to an intervention program. Thus, social marketing techniques could eventually lead to more successful recycling interventions.

Social Cognitive Framework

The following discussion examines individual difference factors that show promise as being relevant to participation in pro-environment activities. These variables were assessed in the present research to determine whether they in fact can discriminate program participants from non-participants. The variables were considered within a social cognitive framework, and thus were categorized based on cognitive social learning person variables (e.g., Mischel, 1973, 1986). Although the cognitive person variables include expectancies, subjective values of outcomes, encoding, self-regulation, and competencies, only the first three were considered in this research, since no literature and no assessment instruments were found relating the other variables to pro-environment behavior. In addition, the

relevance of self-regulation and competencies to environmental behavior is questionable given that most adults have the competencies necessary to recycle.

Social cognitive theory (Bandura & Cervone, 1983; Bandura & Wood, 1989; Mischel, 1973, 1986; Rotter, 1966, 1975; Wood & Bandura, 1989; Wright & Mischel, 1987) provides considerable explanatory power to a variety of behavioral domains (e.g., aggression, social withdrawal, delay of gratification, decision-making, motivation). Mischel (1973, 1986) suggested that cognitive processes mediate the interaction between a person and his/her environment and that in order to obtain better predictions of behavior, consideration of cognitive processes is necessary. Further, Mischel suggested that cognitive person variables are responsible for both the consistency and variability of behavior over time and across situations.

According to social cognitive theory, what people do in a given situation depends on certain person variables. Specifically, their behavior depends on: (a) encoding -- what they focus their attention on and how they categorize and interpret events, (b) competencies -- what cognitive and motor skills they are able to perform in a given situation, (c) expectancies -- what they foresee will happen in the particular situation or in response to a particular behavior, (d) subjective values of outcomes -- the worth they place on various

outcomes, and (e) self-regulation -- the extent to which they use goals and other strategies to manage their own behavior.

Expectancies

Locus of Control.

Locus of control of reinforcement (Rotter, 1966) is an individual's perception that people's reinforcers and punishers are contingent on their own behavior, the behavior of powerful others, or chance occurrences (Levenson, 1974; Rotter, 1975; Strickland, 1989). People who believe they and others can generally control their own reinforcers are considered to have an internal locus of control ("internals"), whereas those who believe people generally are not in control of response consequences are considered to have an external locus of control ("externals"). This construct has been used to explain and predict the behavior of numerous groups of people in various settings. In fact, it is one of the most widely researched constructs in psychology.

If all else is equal (e.g., sense of invulnerability, social responsibility, demographics), one might expect internals to be more likely than externals to participate in a recycling program. This is because internals more than externals should believe that engaging in pro-environment behavior can benefit the physical environment. Only one study was found that addressed this issue (i.e., Levenson, 1974).

Levenson (1974) compared the locus of control scores of individuals who joined an anti-pollution group (n=32), individuals who refused to join the group (n=32), and individuals who were never contacted to join the group (n=32). The scale used in this study partitioned external control into control exerted by powerful others and control that resulted from chance occurrences. Levenson found male members of the anti-pollution group to be reliably less likely than non-members to report believing that chance events controlled their lives. In addition, within the group of male members, those with higher scores on the Chance Factor exhibited reliably less environmental knowledge than those with lower scores on the Chance Factor. It should be noted that female members and non-members did not differ from each other with respect to scores on the locus of control scale. Nonetheless, the relationship between locus of control and environmental behavior warrants further study. As a result, the Rotter Internal-External Locus of Control Scale was included in the test battery used in the present research. This was the original locus of control scale, and a vast quantity of research has been done with it (see reviews by Rotter, 1989; Strickland, 1989).

An important issue with respect to the locus of control construct is how cross-situationally general are locus of control expectancies. Rotter (1975) suggested that while people have generalized

expectancies regarding the controllability of future life events, assessing more specific expectancies yields better predictions of specific behaviors. According to Rotter (1975),

. . . some measure of a very broad generalized expectancy allows prediction in a large number of different situations, but at a low level. A narrower or more specific generalized expectancy should allow greater prediction for a situation of the same subclass but poorer prediction for other kinds of situations that are nevertheless to some degree similar (p. 59).

Some authors (e.g., Jones & Wuebker, 1985; Wallston, Wallston, Kaplan, & Maides, 1976) have responded to Rotter (1975) by developing scales that assess LOC in specific areas. These scales tended to be more effective at predicting the target behavior (i.e., safety and health) than traditional locus of control scales. If, as Rotter implied, the specificity of a LOC scale should match the specificity of the phenomenon to be predicted, an environmental locus of control scale should yield a better prediction of the phenomenon of interest than the traditional scales. As a result, an Environmental Locus of Control (ELOC) Scale that includes questions assessing beliefs regarding the consequences of recycling and other pro-environment behaviors was developed for the present research.

Unrealistic Optimism for Future Life Events.

A second type of expectancy that may be relevant to the collection of recyclables is unrealistic optimism for future life events (Weinstein, 1980). Unrealistic optimism for future life events, also referred to by some as "perception of unique invulnerability," is a systematic belief that one is less likely to incur unpleasant/harmful events and more likely to incur pleasant/positive events than the average person⁴. Questionnaire studies (DeJoy, 1987, 1989; Svenson, Fischhof, & MacGregor, 1985; Taylor & Brown, 1988; Weinstein, 1980; 1983) have demonstrated that people in general tend to perceive themselves as being uniquely invulnerable.

The invulnerability construct may be useful in the social marketing of a recycling program. Individuals are likely to exhibit different degrees of unrealistic optimism. People with high levels of unrealistic optimism might be less likely to act to protect the

⁴It may be thought that examining people's perceptions of their own absolute risk of negative events would be more predictive of their behavior than perceptions of comparative risk. However, Weinstein (1983) reported that predictions of both absolute and comparative risk were about equally associated with objective risk factors. Furthermore, he suggested that people may use social comparison to decide how to behave.

environment, and less likely to participate in a recycling program⁵. Two environmental studies are relevant to the question of whether perceptions of vulnerability are associated with pro-environment behavior.

Tedeschi, Cann, and Siegfried (1982) investigated how participants' perception that pollution had a direct effect on their lives might affect their behavior. Specifically, they surveyed drivers who volunteered to have their auto exhaust emissions checked at a free clinic (n=43) and randomly chosen drivers who did not have their cars inspected (n=63). Those who volunteered were reliably more likely than non-volunteers to report that pollution did have a direct effect on their lives. Similarly, Manzo and Weinstein (1987) found that active Sierra Club members (n=47) were reliably more likely than non-active members (n=29) to respond affirmatively to the following statements: "As far as you know, have you personally suffered any significant negative effects from an environmental problem," and "Has anyone close to you, like family or friends, ever suffered any negative effects from any environmental problem?" Thus, in both studies, the pro-environment subjects were more likely than non-environmentally active subjects to perceive themselves as

⁵Additionally, it may be useful to design an information/communication program that targets perceptions of unique invulnerability for those who are unrealistically optimistic about the environment.

incurring harm from environmental problems. It should be noted that it was not possible in either study to determine whether subjects' perceptions of harm were accurate. Therefore, perceptions of vulnerability/invulnerability should not be assumed to explain pro-environment behavior, although invulnerability seems promising as a predictor of who acts in a pro-environment fashion.

While no other study assessed perceptions of unique invulnerability with respect to environmentally-related outcomes as a factor that might affect engagement in pro-environment behaviors, three studies from the health literature are relevant to this discussion. First, Burger and Burns (1988) found that sexually-active women believed they were less likely than other women to become pregnant. Moreover, the stronger the women's belief of invulnerability to unwanted pregnancy, the less likely they were to have reported using appropriate contraception. Second, just after the Chernobyl nuclear accident, Dolinski, Gromski, and Zawisza (1988) found that Polish students who perceived themselves as being less vulnerable to the ill effects of radiation were less likely than other students to take precautions against radiation exposure (e.g., abstaining from early consumption of vegetables and milk which were particularly susceptible to contamination by radiation). Third, Weinstein (1983) found a significant negative relationship between perceptions of invulnerability to a variety of negative health

outcomes and interest in obtaining information on precautions. Thus, results of these studies suggest that individual differences in the perception of invulnerability may be important in determining whether people behave proactively. Furthermore, individuals with high levels of unrealistic optimism (invulnerability) are expected to be less involved than more realistic individuals in recycling activities because the former are less likely to view environmental destruction as a serious problem.

In addition to the suggestion that unrealistically optimistic individuals are less likely to recycle, it also seems reasonable that extremely pessimistic individuals might be less likely to recycle because they are likely to believe there is little they can do to remedy environmental problems.

The present research used the Life Orientation Test (LOT; Scheier & Carver, 1985) to test the hypothesis that highly optimistic and pessimistic individuals will recycle less than individuals exhibiting moderate levels of optimism/pessimism. This scale has eight optimism/pessimism items and four filler items. The authors found the scale to exhibit acceptable reliability (i.e., Cronbach's Alpha = 0.76, $n=624$; test-retest coefficient = 0.79 over four weeks, $n=142$). In addition, they found it to have predictable patterns of concurrent and discriminative validity for several independent samples of subjects (e.g., $r=.34$ with Rotter I-E Control Scale, $n=320$; $r=.48$

with Rosenberg's Self-Esteem Scale, $n=324$; $r= -.47$ with Beck, Weissman, Lester, & Trexler's Hopelessness Scale, $n=322$; $r= -.49$ with the Beck Depression Inventory, $n=322$; $r= -.55$ with Cohen, Kamarch, & Mermelstein's Perceived Stress Scale, $n=140$).

Subjective Values of the Outcomes

Subjective values of outcomes represent a second class of cognitive social learning person variables likely to influence participation in a recycling program. A subjective value (or utility) refers to a person's preferences and aversions toward certain consequences. Events, situations, activities, and stimuli tend to acquire ". . . the power to induce positive or negative emotional states in the person and to function as incentives or reinforcers for his behavior" (Mischel, 1973; p. 273). Although people's decisions are not altogether free from cognitive distortions (e.g., perceptions of unique invulnerability), there is presumably some rationality to their decision-making. In addition to considering their expectancies regarding the likelihood of various outcomes, people seem to compare the alternative consequences (or outcomes) in terms of both the perceived benefits (e.g., positive emotional states) and costs (e.g., negative emotional states) of each. That is, they consider the subjective values of the outcomes. Hence, different people could share identical expectancies regarding behavior A and behavior B in a given situation but some might choose

A and others B based on their differing subjective values of the expected response consequences. For example, three people in Eugene, Oregon might share the expectancies that the spotted owl will become extinct if deforestation continues in their area and that their personal behavior can influence the outcome (e.g., each has internal locus of control). However, one person is a logger and places a much higher value on her job and the jobs of her co-workers than on the forest and its wildlife. A second acts to protect the endangered species (e.g., lobbies for the Endangered Species Act, increases his efforts to recycle paper to save other species and other forests) because he places a high value on nature and the environment and receives social rewards from friends who share the same values. A third person does not act to protect the species because he does not enjoy the outdoors, places a higher value on other activities he could be doing during that time, and finds it extremely inconvenient to prepare and store recyclables.

Psychological Reactance.

The above example illustrates the importance of defining "outcome" broadly. In addition to values concerning the outcome for the environment, people consider and value differentially the various personal consequences they expect to incur as a result of their behavior. Specifically, people might consider how performing or not performing the behavior might make them feel, what inconveniences

performing the behavior entails (e.g., lost time, gasoline, garage space), what social consequences might result from engaging or not engaging in a behavior (e.g., respect, recognition, alienation).

A potential personal cost of participating in a pro-social program, especially if an intervention is trying explicitly to motivate participation, is a perceived loss of personal freedom. According to Brehm and Brehm (1981), people in general react against perceived threats to their freedom by acting in opposition to perceived coercion. Several authors (e.g., Carver, 1980; Clee & Wicklund, 1980) have corroborated this theory. In addition to people in general reacting against threats to their freedom, it seems reasonable that individuals differ with respect to their tendencies to be psychologically reactant over time and across situations. If this is the case, few high reactant individuals would be expected to respond to a recycling intervention. In the present study, psychological reactance was assessed with Merz's Psychological Reactance Scale (Tucker & Byers, 1987). Tucker and Byers (1987) found this scale to demonstrated adequate reliability (i.e., split-half = 0.84; inner consistency = 0.90; test-retest = 0.86), and the items have face validity.

Encoding

Besides expectancies and subjective values, a third major class of cognitive social learning person variables is encoding. Encoding

refers to what a person attends to and how s/he perceives, interprets, and categorizes information (Mischel, 1986). No study was found that assessed encoding adequately with respect to environmental phenomena. However, a scale that assesses environmental concern (Weigel & Weigel, 1978) may be relevant to encoding.

Environmental concern is likely to be influenced by how an individual encodes environmentally-related information. Therefore, Weigel and Weigel's (1978) Environmental Concern Scale may also indicate how environmental information is encoded. The authors assessed the psychometric properties of the scale, and found the scale to be internally consistent, homogeneous, and temporarily stable (i.e., Cronbach's alpha = 0.85, n=162; Scott's homogeneity coefficient = 0.26, n=162; test-retest correlation = 0.83 after six weeks, n=25). The authors also tested the predictive validity of the instrument. Specifically, they compared the scores of active Sierra Club Members (n=126) with controls who were randomly selected from a medium-sized New England town (n=162). They found Sierra club members to have reliably higher scores on the scale than the controls. Furthermore, the authors examined the relationships between scores on the Environmental Concern Scale and subjects' agreement to perform and actual performance of pro-environment behaviors. Specifically, starting three months after subjects from

the control group had taken the questionnaire and over a five-month period, they were contacted three times by three different confederates. Each time the subjects were contacted they were asked to participate in a pro-environment activity (i.e., signing 3 petitions; assisting in a road-side trash pick up program; assisting with a local recycling program). The correlations between Environmental Concern and each of the behavioral probes were moderately high and reliable. Specifically, the correlation with petition signing was 0.50, with litter pick up 0.36, and with recycling behavior 0.39. The correlation between the scale and a comprehensive behavioral index (i.e., a composite of the 3 behavioral scores) was 0.62. In the current research the Environmental Concern Scale was used to determine whether high and low scorers differ in participation in the recycling program.

Conclusions

The previous section reviewed several cognitive social learning person variables that show promise for being associated with participation in a recycling program and warrant further research investigation (i.e., expectancies: locus of control and unrealistic optimism; subjective values of outcomes: psychological reactance; and encoding: environmental concern).

Major Goals of the Present Research

The first major goal of the present research was to determine whether a program that gives employees the opportunity to bring recyclables to work would be feasible. In addition to the benefits of a corporate-based program enumerated in Table 1, corporate centers for home-generated recyclables would be both fuel-efficient and time-efficient for employees who do not receive curbside recycling service at their homes.

Second, while the recycling literature demonstrated a variety of intervention strategies to increase participation in recycling programs, few studies were found that compared more than two or three interventions. By not using many different interventions in the same setting with the same target population, it is difficult to determine the relative efficacy of these interventions. Thus, a major goal of the present study was to compare the impact of several different types of interventions which have been effective at increasing participation in a recycling program. The present research used the following intervention strategies: appeals, indigenous intervention agents, the "rejection-then-retreat" technique, indebtedness, goals plus feedback, and raffles.

A third major goal was to determine the feasibility of using electronic and phone mail to motivate voluntary, pro-social behaviors in a corporate setting. In order to convince companies that it is

practical and desirable to promote non-work related pro-social behavior, it is desirable for interventions to require minimal time from employees. As a result, the present study did not use face-to-face interactions with employees but rather used single message interventions based on the motivational strategies listed above.

Finally, the present research hoped to determine whether person variables discriminate responders and non-responders to interventions that promote the preparation and transportation of recyclables. If variables were found that could make such a discrimination, it might be possible to increase the efficiency of recycling interventions by allowing program planners to segment the population and tailor interventions accordingly.

Hypotheses

Efficacy of Electronic and Phone Mail

Although Walker (1987) found that e-mail was an effective tool for delivering a stress management intervention, differences in the target behaviors and target populations between that study and the present study preclude a prediction regarding whether e-mail would be an effective mode for disseminating program information in the current study. Specifically, participants in the Walker (1987) study volunteered for the program because they had a problem for which they wanted help, whereas employees in the present study were not volunteers.

No hypotheses were made regarding the relative effectiveness of e-mail, phone mail, and traditional office memos, because no research studies were found that had a bearing on this question.

Relative Effectiveness of Intervention Strategies

No predictions were made regarding the relative effectiveness of the different intervention strategies for increasing participation in the program. This is because studies were not available in the recycling literature that compared two or more of the interventions used in the present study. In addition, the substantial differences in the settings and populations used in the present study as compared to the recycling studies found in the literature precluded using effect sizes from these studies to predict the relative effectiveness of the techniques in the present study.

Concurrent and Discriminative Validity of the

Environmental Locus of Control Scale

The Environmental Locus of Control (ELOC) scale⁶ was expected to show moderate, positive correlations with the following scales for the following reasons:

⁶Larger scores on this scale reflect a more internal locus of environmental concern.

1. The Life Orientation Test (LOT), measuring optimism -- since optimistic individuals are more likely to believe there are solutions to difficult environmental problems, and they personally can contribute to solving the problems;
2. The Environmental Concern Scale -- since environmentally concerned individuals may be more likely to explore what behaviors they may perform that will help the environment thereby increasing their belief that they can protect the environment;
3. The Political Factor of the Rotter I-E Control Scale -- since both it and the ELOC scale are designed to measure peoples' perceptions of their ability to control the world around them, though the Political Factor assesses more general expectancies than the ELOC scale.

The ELOC scale was expected to show a moderate, negative correlation with the following scale for the following reason:

4. The Psychological Reactance Scale -- since by definition people with an internal locus of control (i.e., high ELOC score) believe they have control over consequences, giving them a sense of personal freedom (i.e., low reactance score).

Person Variables and Participation in the CRC Recycling Project

Levenson's (1974) finding that members of an antipollution group were less likely to have external loci of control than those who refused to become members suggest that:

5. A disproportionately large number of employees scoring in the internal direction on the Rotter I-E Control Scale and a disproportionately small number scoring in the external direction will participate in the program; and

6. A disproportionately large number of employees scoring in the internal direction on the ELOC Scale and a disproportionately small number scoring in the external direction will participate in the program.

According to Rotter (1975), in order to be most predictive, the specificity of a locus of control scale should match the specificity of the phenomenon to be predicted. Thus, it was expected that:

7. The ELOC Scale will be better than the Rotter I-E Scale at predicting participation in the recycling program.

Based on the findings by Weigel and Weigel (1978) that people receiving high scores on the Environmental Concern Scale were more willing than low scorers to agree to engage in pro-environment behaviors and that members of a Sierra Club chapter had higher Environmental Concern scores than randomly selected non-members, it was hypothesized that:

8. A disproportionately large number of environmentally concerned employees and a disproportionately small number of environmentally disinterested employees will bring recyclables to work.

The discussion of unrealistic optimism and pro-environment behaviors (above) suggest that:

9. A disproportionately large number of employees with intermediate scores on the Life Orientation Test (measuring optimism) and disproportionately small numbers of employees with high and low scores will participate in the program.

If Psychological Reactance proves to be a factor that differs consistently among individuals (i.e., it is a personality factor), the following is hypothesized:

10. A disproportionately small number of employees with high scores on the Psychological Reactance Scale and a disproportionately large number of employees with low scores will participate in the program.

Preliminary Research

Preliminary research for this project was conducted in one of the four buildings of a corporate research center associated with Virginia Tech. The building used in the preliminary research houses the university's computing center and a company that specializes in communications; the building will be referred to as Building I. A total of 183 employees worked in Building I, and nearly all employees in the building use electronic mail (e-mail) as a regular source of communication with co-workers and management.

Prior to the beginning of data collection (August 1, 1990), an effort was made to determine the approximate percentage of Building I employees who would receive curbside recycling service at home⁷. An e-mail message was sent to employees informing them that the author was considering conducting a recycling program at Building I. The message asked the employees to indicate whether they would be receiving Blacksburg curbside recycling beginning in September (see Appendix A-1 for the message).

After several follow-up messages, 107 employees responded regarding their curbside status (i.e., a 64% response rate). Of these, 53 reported they would not be receiving curbside service, and 54 reported they would. In other words, 50% reported they would be receiving the curbside service. The addresses of non-responders to the inquiry were looked up in the university directory and compared with a list of households in the town receiving curbside service (obtained from the town engineer). From this procedure, the author found that 15 non-responders would be receiving curbside service, 29 would not be receiving curbside service, and the curbside status of the remaining non-responders could not be determined (e.g., the

⁷At the beginning of September 1990, the town of Blacksburg started a curbside recycling program in which homeowners had the opportunity each week to place plastic, glass, aluminum, and newspaper on their curb for pick-up. In addition, the town provided each household with a container to make preparation of recyclables more convenient.

employees' addresses did not appear in the university directory). Combining the data from self-reported curbside status and curbside status of employees obtained from a town listing of Blacksburg homes that would receive curbside service suggested that approximately 46% of employees (curb = 69; no curb = 82) at Building I would be getting curbside recycling.

On the week prior to data collection, a message was sent to all employees that: (1) informed them the author would conduct a recycling program in their building, (2) inquired about when they arrive and leave work, and (3) gave them information regarding how to participate (see Appendix A-2 for the message). The reason for inquiring about the time employees arrive and depart from work was to determine the best time for collecting recyclables. Only 23 employees responded to this inquiry. All but two of these reported arriving at work between 7:30 and 8:45 a.m. and leaving work between 4:30 and 5:45 p.m. In addition, the directors of the computing center and the communication organization confirmed that most employees arrived and departed at these times. As a result, Tuesday morning between 7:30 and 8:45 a.m. and Thursday afternoons between 4:30 and 5:45 p.m. were chosen as collection times. Weekly reminders were sent to employees each Sunday night, the first of which informed employees of the new collection times (see Appendix A-3 for the reminders).

Preliminary research was conducted between August 7th and September 13th, 1990. During collection times, the author and/or (an) undergraduate research assistant(s) received materials from employees and obtained the employees' USERID[®]. No employee resisted providing his/her USERID. The data collector(s) then: (a) used a 32-pound capacity Seca baby scale to weigh separately all the clear glass and aluminum cans that each employee delivered, (b) recorded the number of recyclable objects delivered in each category, and (c) noted specifically how the materials were prepared for collection (i.e., were they separated? cleaned? were cans crushed?). The data collector(s) recorded this information on the data sheet next to the employee's USERID. At the end of the data collection session, the data collector(s) placed the materials in collection bins located at the loading dock. As needed, materials were taken to a nearby recycling center.

Figure 1 represents the number of Building I employees delivering glass or aluminum cans on consecutive collections days. Between zero and three employees delivered recyclables per day over the course of the preliminary research, the mean being 2.5. In total, 17 different

[®]A USERID is an unique name each e-mail user chooses that enables him/her to be identified and contacted by other e-mail users. A list of the names and USERIDs of all employees on the system is available to any user logged on to the system.

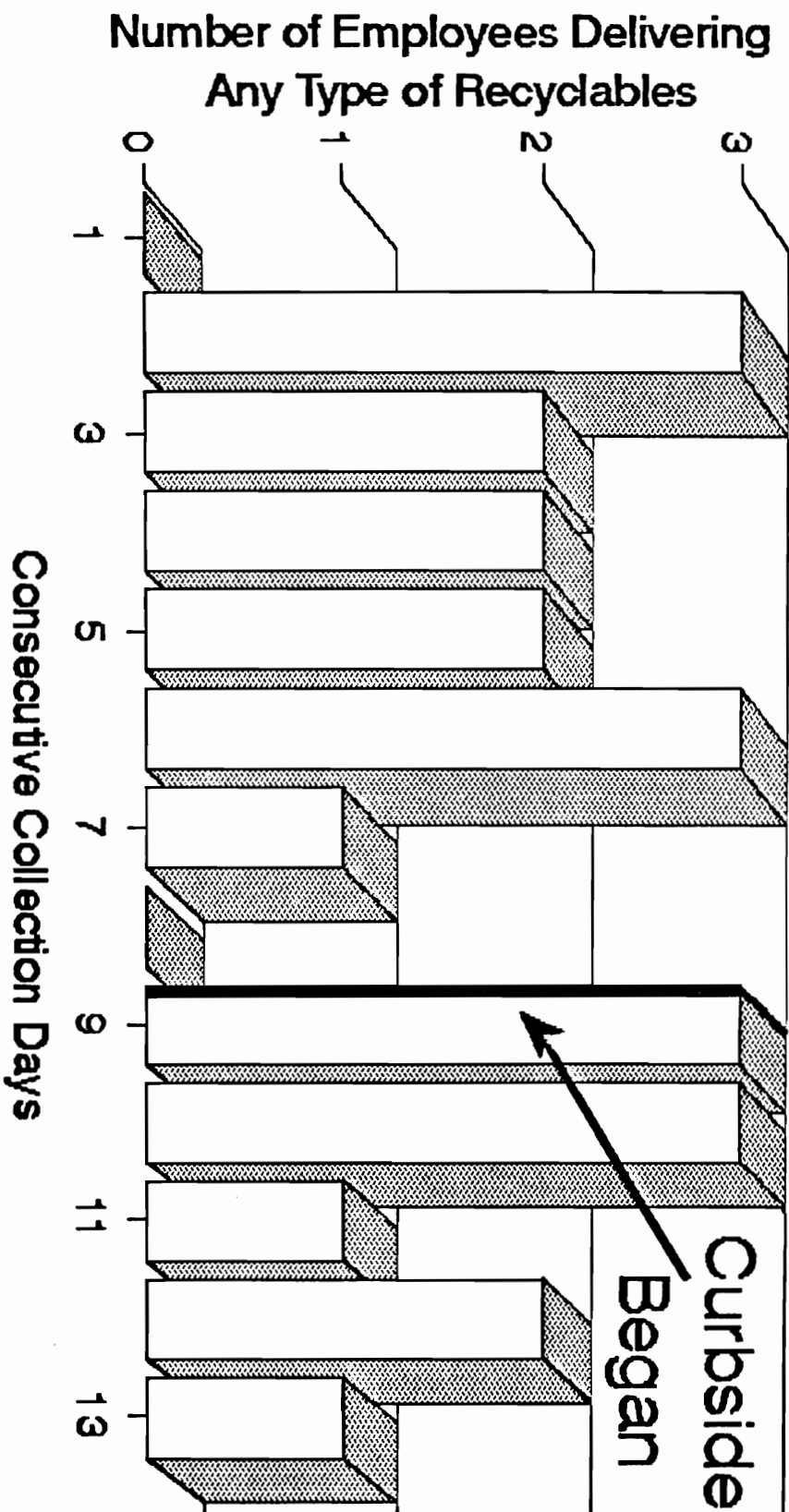


Figure 1. Number of Employees Delivering Any Type of Recyclables during Consecutive Collection Days.

employees (i.e., 9% of the population) delivered recyclables, 5 of whom participated more than once. Although there were 22 separate deliveries, aluminum was only delivered on 7 of these occasions. On occasions when glass items were delivered, the mean number of glass items per delivery was 14.3 +/- 11.8 (s.d.), and the mean weight per delivery was 10.5 +/- 8.8 (s.d.) pounds. On occasions when aluminum cans were delivered, the mean number of cans per delivery was 43.9 +/-66.4 (s.d.), and the mean weight was 3.0 +/- 5.1 (s.d.) pounds. (The number and weight of the aluminum cans were greatly influenced by a single employee who delivered 193 cans on one occasion. Omitting that delivery, the mean number of cans delivered per visit was 19.0.)

As depicted in Figure 1, the introduction of curbside recycling did not seem to affect the number of employees delivering recyclables to Building I. The most noteworthy finding of the preliminary research was the low rate of participation. It was thought that perhaps part of the reason for non-participation was that it was summer and many employees may have been on vacation during part of the collection period. In addition, the limited hours in which employees had the opportunity to deliver recyclables (i.e., 2.5 hours per week) was thought to decrease participation. Finally, limitations on the types of recyclables collected may have prevented some employees from participating. Thus, in order to increase

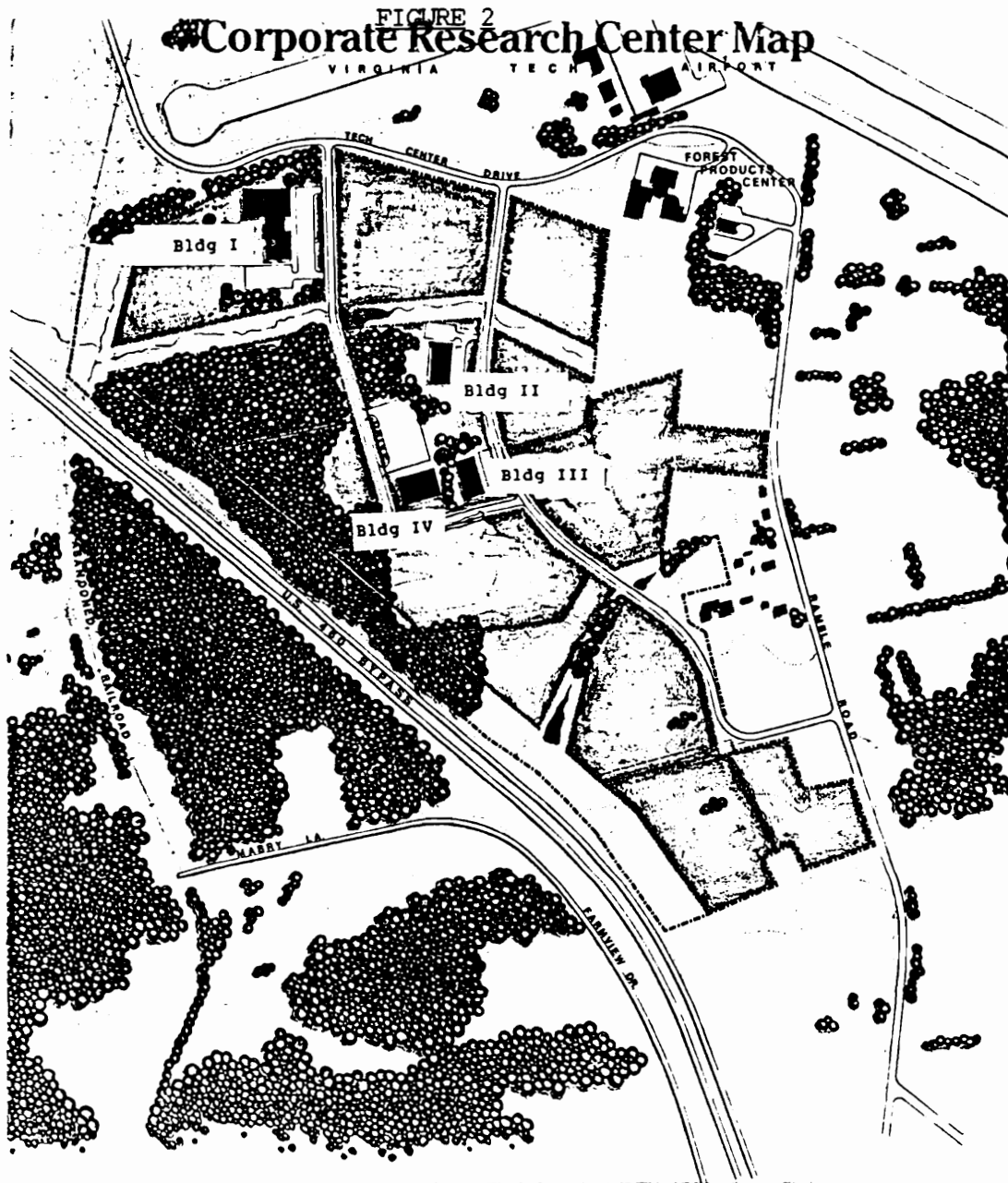
participation, employees were allowed to deliver recyclables any time during the work week, and newspaper was added to the list of acceptable recyclables, thereby making the program more comprehensive.

METHOD

Setting and Subjects

The present research was conducted in all four buildings of Virginia Tech's Corporate Research Center (CRC). The employees of these buildings constituted the targeted population in this research. Building I, the building at which the preliminary research was conducted, is situated apart from the other three (see Figure 2 for a schematic of the CRC). The other three buildings in the CRC are in close proximity to each other. Building II houses the university library's computerized "card" catalog system, employing 66 people. Building III houses a division of the university's engineering department and employed 154 individuals during the course of the study. Building IV houses seven small organizations, ranging in size from 1 to 16 employees. The total number of employees in Building IV was 40.

Two estimates of the number of employees receiving curbside recycling service were made. The first estimate, mentioned in the preliminary research section, suggested that 46% of Building I employees received curbside service. The second estimate was based on CRC employees' response to a questionnaire item inquiring about their curbside status. (The questionnaire is discussed in detail below.) Of the 211 CRC employees who responded (i.e., 64% of the CRC



population), 34% indicated that they were receiving curbside service. Thus, between about 1/3 and 1/2 of employees at the CRC apparently received curbside service. Of the 443 employees at the CRC, most are white collar workers, and less than 10% of employees at the center are Black, Hispanic, or Asian.

Experimental Procedures and Design

Person Variables Questionnaire

At the beginning of the study, all employees received a questionnaire battery in order to investigate relationships between person variables, self-reported recycling, and observed recycling. Questionnaire instructions requested that participants record identifying information (i.e., USERIDs for Building I employees; the last four digits of social security numbers for employees of all other buildings) on the questionnaire booklet. Employees were given reassurance that only the researchers would have access to the information and that otherwise their responses would be kept completely confidential. The cover page of the questionnaire informed employees that if they completed the questionnaire, they would be eligible to win lottery prizes of \$10, \$25, and \$50 (see Appendix B for a copy of this cover page). In addition to increasing the likelihood that more employees in general would return questionnaires, the monetary incentive may have decreased selection bias to some degree. That is, without external incentives, it is

likely that more employees interested in the environment than environmentally disinterested employees would have returned completed questionnaires. Linking returning questionnaires with a chance to win a monetary prize is likely to have increased the number of environmentally disinterested employees returning questionnaires.

The battery included the following scales: items from the Rotter Internal-External Control Scale (Rotter, 1966; Appendix C-1); an environmental locus of control scale (ELOC) developed especially for this research (Appendix C-2); the Life Orientation Test (LOT; Scheier & Carver, 1985), a test of optimism/pessimism (Appendix C-3); Merz's Psychological Reactance Scale (Tucker & Byers, 1987; Appendix C-4); an Environmental Concern Scale (Weigel & Weigel, 1978; Appendix C-5); and some miscellaneous items (Appendix C-6). Miscellaneous items assessed demographic characteristics, access and usage of electronic and phone mail, frequency of participation in any recycling program, and location of recycling centers used.

The Rotter Scale items and the miscellaneous items were presented in a separate blocks from the other items in the battery because the format of the former were different than the format of the latter. Items from the remaining scales (i.e., Environmental Concern Scale, Life Orientation Test, Psychological Reactance Scale, and ELOC) were randomly interspersed, each with a six-point Likert format.

Abbreviation of the Rotter I-E Control Scale

The author decided to abbreviate the Rotter Internal-External Control Scale to make the questionnaire shorter, and thereby increase the likelihood that more employees would return their questionnaires. (The intact Rotter Scale is 29 items including 6 buffer items which would have made the questionnaire 117 items long.) From the list of 23 non-buffer items of the I-E scale, nine were randomly selected for the questionnaire battery (items 3, 6, 11, 13, 17, 18, 21, 25, and 26 from the original Rotter Scale were included in the battery; see Appendix C-1). In order to determine the amount of variance the abbreviated scale accounted for in the larger scale, the author gave the intact scale to 61 undergraduate students from two sophomore level psychology classes. The correlation between the intact scale and the items comprising the abbreviated scale was 0.72, indicating that the abbreviated scale accounted for 52% of the variance in the intact scale ($p < .001$).

Several authors (i.e., Lange & Tiggenmann, 1981; Little, 1977; McInish & Srivastava, 1982) factor analyzed the Rotter I-E Control Scale and found two reliable factors -- the Personal Control and Political Control Factors. As a result, the author performed correlations between each of these factors from the intact scale and

the corresponding factors from the abbreviated scale⁹. The correlation between the intact and abbreviated scales on the Personal Control Factor was 0.80 ($p < .001$; accounting for 64% of the variance) and 0.66 for the Political Control Factor ($p < .001$; accounting for 44% of the variance).

Development of the Environmental Locus of Control Scale

In order to calculate the test-retest reliability of the ELOC Scale, 33 undergraduate, enrolled in a sophomore psychology class, were administered the scale twice, two weeks apart. The test-retest reliability coefficient was 0.92. The coefficient of internal consistency for the scale was 0.90 ($N = 211$ employees); it was calculated by correlating the odd and even items and adjusting the coefficient with the Spearman-Brown correction (Cascio, 1982)¹⁰.

Data Collection

Employees were sent an initial paper memo informing them about the project (see Appendix D). This memo described the types of recyclables that would be accepted, how the recyclables should be prepared, the location of the barrels, and the times they could

⁹The items comprising the Personal Factor on the intact scale were: 2, 5, 6, 9, 11, 13, 15, 16, 18, 21, 23, 25, and 28; Lange & Tiggenmann, 1981. Of these, items 6, 11, 13, 18, 21, and 25 were also on the abbreviated scale. The items comprising the Political Factor on the intact scale were: 3, 4, 7, 10, 12, 17, 20, 22, 26, and 29. Of these, items 3, 17, and 26 were also on the abbreviated scale.

¹⁰ $r_{\text{corrected}} = 2r_{\text{odd.even}} / (1+r_{\text{odd.even}})$

deliver recyclables. Any time during the work week, employees from each building had an opportunity to deliver aluminum cans, newspaper, and clear glass to storage barrels placed in or behind their building. A sign (see Appendix E for the wording) was taped to each barrel, designating the type of recyclable it was to contain and requesting that employees write identifying information (i.e., USERIDs for Building I employees; last four digits of social security number for all other employees) on each bag of recyclables they delivered. Magic markers and extra bags were available at the barrels.

Each workday morning the author or a research assistant visited the collection areas and weighed each bag of clear glass and newspaper, and counted the aluminum cans; s/he then recorded this data and the USERID or last four digits of the social security number of the employee who left the recyclables on a page of the data collection sheet corresponding to the building where the employee left recyclables. When bags of materials did not have identifying information on them, the data collector used the same procedures as above, except s/he recorded "unidentified" in the "Id" column of the data sheet and also on the bag of recyclables. The dependent variables were: (a) the weight of clear glass per delivery, (b) the weight of newspaper per delivery, (c) the number of beverage cans per

delivery, and (d) the daily number of employees who delivered each type of recyclable.

After weighing and counting the recyclables, the data collector wrote his/her initials and the date on the bag of materials and returned it to the barrels. For approximately a third of the data collection days, research assistants recorded the information for bags of recyclables from the previous workday (identified by the dates on the bags). Therefore, for approximately a third of the data, there were two sets of independent observations that could be used later to calculate reliability. One day per week, members of a campus service fraternity emptied the barrels after the data collectors had collected data for that day.

Modes of Communication

For each intervention, employees received a single message on the Monday morning of the intervention week. Employees at the different buildings received messages similar in content but different in communication mode. Specifically, each employee at Building I received intervention messages via e-mail; each employee at Building IV received traditional office memos with intervention information; for the first five interventions, each Building II employee and 20% of Building III employees (i.e., each Building III employee who had phone-mail service) received phone-mail messages. The phone-mail messages to Building III included an additional brief statement

asking message recipients to share the content of the message with Building III employees who did not get phone mail. Thus, message recipients were asked to serve as indigenous intervention agents (i.e., to advertise the recycling program). For the last three interventions, each employee at Buildings II and III received traditional office memos instead of phone mail messages, because after the earlier interventions, many employees in these buildings complained about the phone mail messages.

Description of Intervention Techniques

Five different types of interventions were used to motivate employees to recycle. The first type involved sending pro-environment/pro-recycling messages. The first of these (see Appendix F-1) was written by the first author and sent under the name of the Director of the Corporate Research Center (CRC). It emphasized the Center's support for the project, the importance of protecting the environment and of conducting research in the area of environmental protection, and mentioned the importance of setting a pro-environment example for other corporations.

The second appeal message (see Appendix F-2) was sent by an expert in the area of environmental protection. His letter discussed environmental problems and gave specific response information regarding what employees could do about environmental problems,

stressing that bringing recyclables to work was a good place to start.

The second type of intervention attempted to use the "foot-in-the-door" approach (Freedman & Fraser, 1966). The small, initial request was that employees pick up free pro-recycling bumper stickers in a designated place in their buildings, and the larger, subsequent request was to bring recyclables to work (see Appendix G for the intervention message). Since only about 5% of the CRC employees complied with the initial small request, this was not an adequate test of the "foot-in-the-door" technique. However, since the second request was made immediately after the rejection of the initial request, this intervention constitutes a "rejection-then-retreat" approach.

The third type of intervention attempted to use Indebtedness (Regan, 1971) to motivate employees to bring recyclables to work. Since employees did not pick up the bumper stickers as requested, stickers were subsequently placed in each employee's mail with a request to participate in the recycling program (see Appendix H for the message). In the present research, even though employees may not have valued the gift (as evidenced by their failure to pick up free bumper stickers), the overpowering nature of the Indebtedness Technique suggests they should have felt obligated to reciprocate by bringing their recyclables to work.

The fourth type of intervention involved giving goals plus feedback to each building. Assigned goals were tailored to each building based on the weight of newspaper and glass that the building collected in prior weeks. Following the findings of Becker (1978), the goals in the current study were designed to be challenging but attainable. Feedback was given to employees regarding the amount of newspaper and glass their building and the other three building collected during the previous week. It should be noted that since the number of aluminum cans were not targeted in the messages, this variable served as a control. Employees received two goal plus feedback messages (see Appendices I-1 and I-2 for the content of the messages).

The fifth type of intervention involved prize raffles in which employees' names were entered into a prize drawing if they delivered recyclables to their building. The number of times employees' names were entered was based on the quantity of recyclables delivered. Specifically, during the weeks of the raffle, employees' names were entered into a drawing one time for every five aluminum cans they brought to the center. Thus, pounds of glass and newspaper served as controls in these interventions. Each building had two raffles during two consecutive weeks. However, separate raffles were performed for Building I versus Buildings II-IV, and the introduction

of each raffle was delayed in Buildings II-IV. Therefore, there were a total of four different raffles.

In the first week of the raffle intervention, several small prizes (including free dinners at local restaurants, free haircuts, a vehicle lubrication job, gift-certificates, etc.) were available. In the second week, two free, round-trip airline tickets to anywhere in the continental U.S. were available. For the first raffles, the probability of winning one of the small prizes was 1 in 16 at Building I and 1 in 22 at the other three buildings. For the second raffles, the probability of winning an airline ticket was 1 in 183 at Building I and 1 in 260 at the other buildings. All prizes were donated by local merchants (see Appendices J-1 and J-2 for messages).

While there were five types of intervention strategies, there were actually eight interventions -- two appeals, one "rejection-then-retreat" message, one indebtedness message, two goal plus feedback messages, and two raffle messages.

A single message was used for each intervention for a variety of reasons. First, employees are likely to have found single messages per intervention less intrusive than they would have found multiple messages. Second, Americans in general and CRC employees in particular have expressed a strong commitment to the environment and therefore were expected to be particularly responsive to interventions that target recycling. Recent national surveys

consistently indicate that Americans are currently more environmentally concerned than they have been in the last several decades (Byers, 1990). For example, 74% of Americans reported that "protecting the environment is so important that requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost," whereas in 1981, only 45% of sampled Americans endorsed this statement (Wald, 1990). Indeed, according to Michael Deland, chairman of the President's Council on Environmental Quality, environmentalism and an environmental ethic has become mainstream (Wald, 1990). In addition, the questionnaire results from the CRC population indicated that employees on average were extremely environmentally concerned (see below for results of the questionnaire).

Third, the ease of implementing a program that only requires an occasional e-mail or phone mail message would make the promotion of the program to other companies much easier than if the program were more costly. Finally, employees might be more likely to become involved in designing interventions themselves if it just required them to design single message interventions once every few weeks.

Experimental Design

Figure 3 shows the modified multiple baseline design across buildings used in this study. For each intervention, instead of staggering its introduction at each building, Building I received it

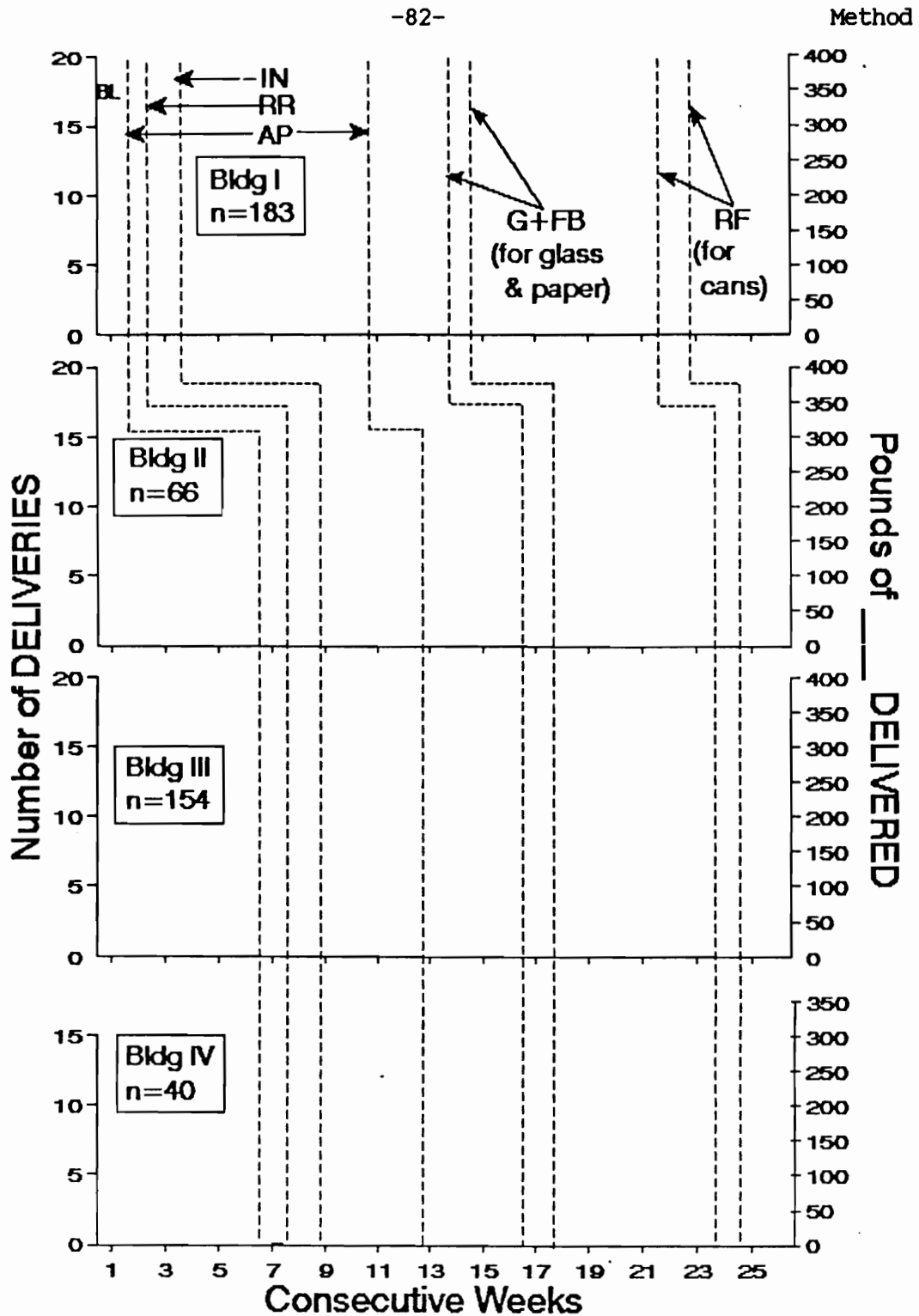


Figure 3 Weekly number of DELIVERIES of ___ and weekly pounds of ___ DELIVERED at each building during baseline (BL), appeals (AP), rejection-then-retreat (RR), indebtedness (IN), goals plus feedback for glass and paper (G+FB), and raffles for cans (RF) interventions.

first, and then after a delay of two or more weeks, the other three buildings received the intervention simultaneously. If the introduction of interventions at each building were staggered, the project would have required at least double the time. The author staggered interventions at Building I with the interventions at the other three buildings since Building I is geographically removed from the other buildings (see Figure 2 on page 70 for the schematic of the CRC). Thus, the probability of diffusion of interventions and the resulting threats to internal validity were reduced.

RESULTS

Reliability

Two independent observers were used for 35% of newspaper deliveries. The reliability of measurement for newspaper deliveries was calculated as follows: (a) for each delivery, the lighter weight of the two independent observations was divided by the heavier weight; (b) the quotient was converted to agreement percentage by multiplying by 100; and (c) the mean and standard deviation of the agreement percentage for all newspaper deliveries were calculated. This resulted in a mean agreement percentage of 95% +/- 13% (s.d.). The mean agreement percentage for glass was calculated in an identical fashion. Two independent observations were made for 34% of glass deliveries, and mean agreement percentage was 93% +/- 13% (s.d.). Reliability of aluminum cans was calculated in an analogous manner (i.e., for each delivery, the observation with the smaller number of cans was divided by the observation with the larger number of cans). Two independent observations were made for 38% of deliveries, and the mean agreement percentage was 98% +/- 7% (s.d.). There was an 100% agreement for the number of deliveries of each type of recyclable.

At the completion of the study, the accuracy of the scale used to weigh newspaper and glass was checked by weighing standardized

kilogram weights. Within the range of 200 g (i.e., 7 oz) to 14.5 kg (i.e., 32 lbs), each reading was within 1% of the standard weights.

Comparison of Intervention Components

Over the course of the project, employees delivered 5824 aluminum cans, 5445 pounds of newspaper, and 969 pounds of glass. Tables 2A, 2B, and 2C respectively display: (a) the number of deliveries during each intervention for the entire Corporate Research Center (CRC), (b) the quantity of each type of recyclable delivered during each intervention, and (c) the mean quantity of each type of recyclable per delivery during each intervention. As can be seen in Table 2A, the proportion of employees participating in the program was quite low. Tables 2A, 2B, and 2C show that only the raffle interventions (which targeted only cans) increased delivery of aluminum cans. In addition, none of the interventions that targeted glass and paper (i.e., all of the interventions except the raffles) was effective at increasing collection of these recyclables. However, it is interesting to note that even though the raffles targeted only cans, the weight of newspaper delivered (Table 2B) and the mean weight of newspaper per delivery (Table 2C) increased during the raffles.

The interested reader may turn to Appendix K for tables showing the response patterns of individual employees during the eight different interventions.

Table 2A. Number of deliveries for each type of recyclable during each intervention for the entire CRC (AP = appeal, RR = "rejection-then-retreat," IN = indebtedness, G + FB = goals plus feedback, RF = raffle; N = 443).

	AP1	RR	IN	AP2	G+FB1	G+FB2	RF1	RF2
CANS	7	8	0	6	2	5	18	58
GLASS	8	8	1	3	5	8	7	5
PAPER	13	20	10	7	11	17	15	11

Table 2B. Number of cans and pounds of paper and glass delivered during each intervention for the entire CRC (AP = appeal, RR = "rejection-then-retreat," IN = indebtedness, G + FB = goals plus feedback, RF = raffle, N = 443).

	AP1	RR	IN	AP2	G+FB1	G+FB2	RF1	RF2
CANS	115	75	0	80	18	35	439	3101
GLASS	53	40	4	22	53	58	31	13
PAPER	217	279	133	78	151	177	372	248

Table 2C. Mean number of cans per delivery and pounds of paper and glass per delivery during each intervention for the entire CRC (AP = appeal, RR = "rejection-then-retreat," IN = indebtedness, G + FB = goals plus feedback, RF = raffle, N = 443).

	AP1	RR	IN	AP2	G+FB1	G+FB2	RF1	RF2
CANS	16.4	9.4	0.0	13.3	9.0	7.0	24.4	53.5
GLASS	6.6	5.0	4.0	7.3	10.6	7.2	4.4	2.6
PAPER	16.7	14.0	13.3	11.1	13.7	10.4	24.8	22.6

Figures 4 through 6 present the data graphically. Figure 4 depicts the number of deliveries of aluminum cans and the number of aluminum cans delivered; Figure 5 depicts the number of deliveries of glass and the pounds of glass delivered; and Figure 6 illustrates the number of deliveries of newspaper and pounds of newspaper delivered. In each of these figures, deliveries per week represent the number of different employees delivering the particular type of recyclable during the week plus repeat visitors. For example, if an employee brought aluminum cans to his/her building on two different days in a given week, s/he would contribute two aluminum can deliveries to that building's weekly total.

In Figures 4 through 6, the left y-axis represents the number of deliveries of the particular type of recyclable, and the bars are white. The right y-axis represents the quantity of the particular type of recyclable delivered (i.e., number of aluminum cans or pounds of newspaper or glass), and the bars are shaded. The x-axis represents the consecutive weeks of the program, and the dotted lines correspond to the days on which the eight intervention messages were sent to the employees. The four graphs contained within each of the figures represent the four buildings in the CRC. Since glass and paper, not aluminum cans, were targeted by the Goals plus Feedback interventions, number of deliveries of aluminum cans and number of

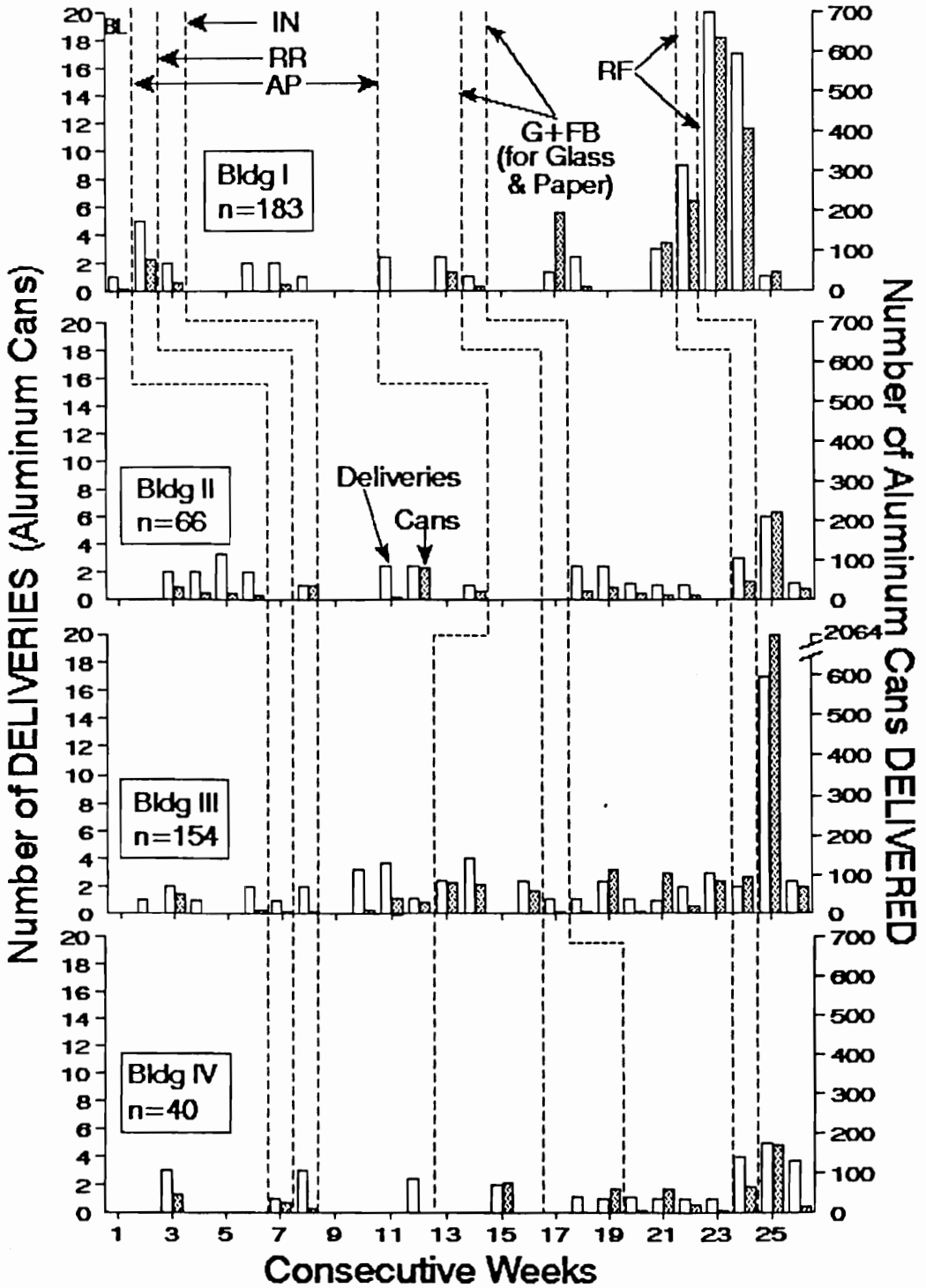


Figure 4. Weekly number of DELIVERIES of aluminum cans (□) and weekly number of cans DELIVERED (▨) to each building during baseline (BL), appeals (AP), "rejection-then-retreat" (RR), indebtedness (IN), goals + feedback (G+FB) for glass and paper, and raffle (RF) interventions.

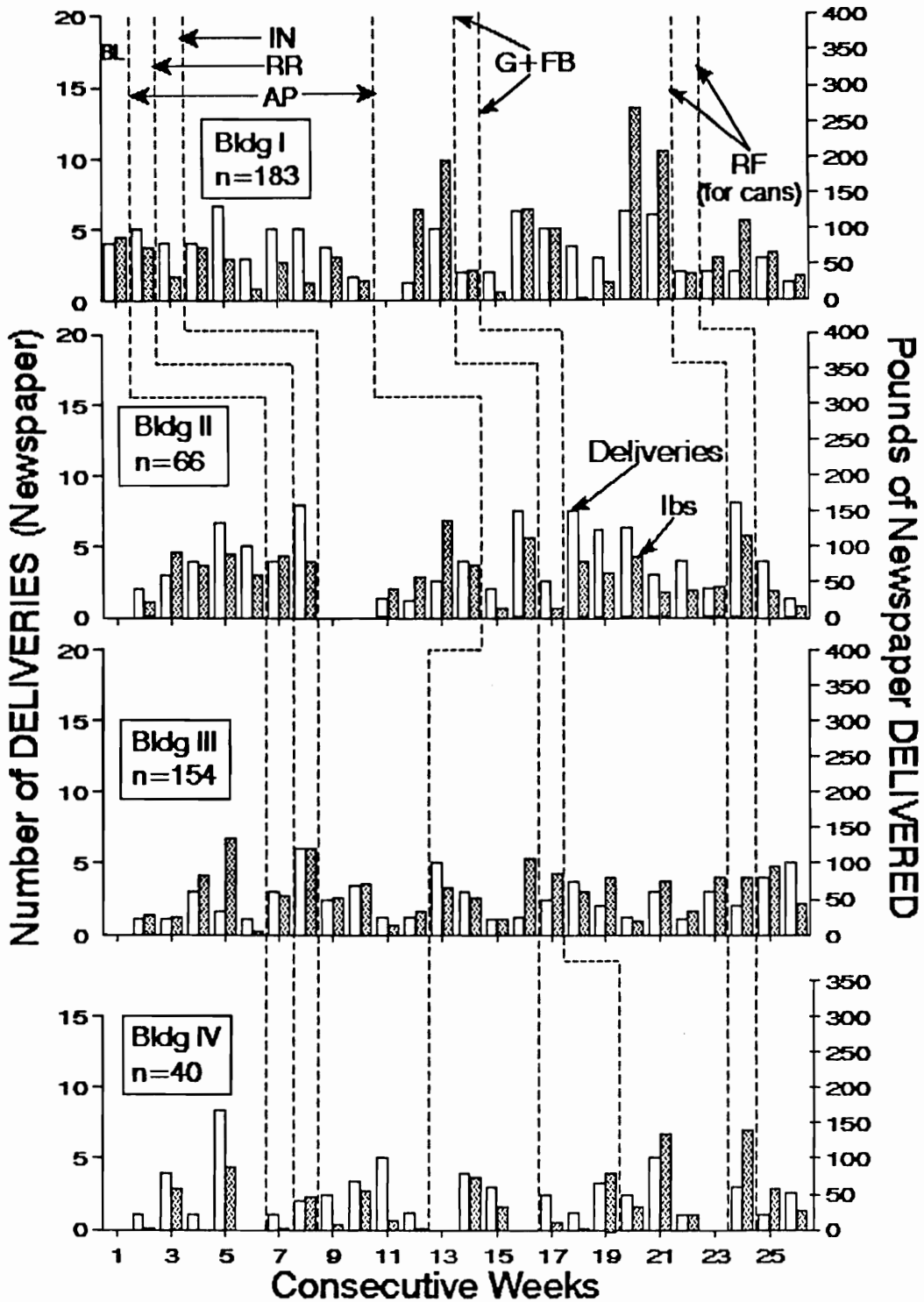


Figure 5. Weekly number of DELIVERIES of newspaper (□) and weekly pounds of newspaper DELIVERED (▨) at each building during baseline (BL), appeals (AP), "rejection-then-retreat" (RR), indebtedness (IN), goals and feedback (G+FB), and raffles for cans (RF) interventions.

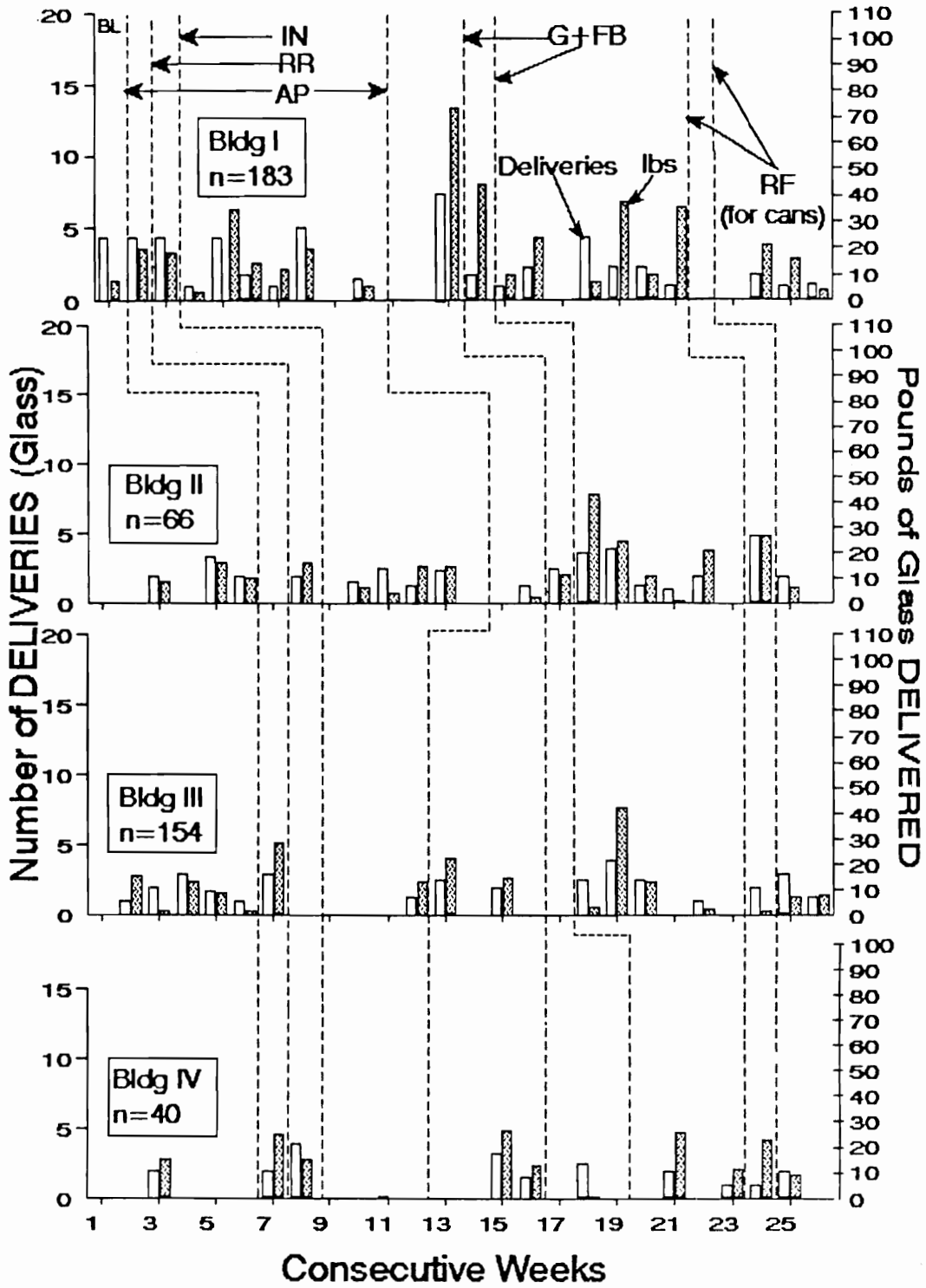


Figure 6. Weekly number of DELIVERIES of glass (□) and weekly pounds of glass DELIVERED (▨) at each building during baseline (BL), appeals (AP), "rejection-then-retreat" (RR), indebtedness (IN), goals and feedback (G+FB), and raffles for cans (RF) interventions.

cans delivered (Figure 4) represent controls for random fluctuations in the glass and paper data. Similarly, since aluminum cans, not glass and paper, were targeted by these the raffles, number of deliveries of glass and paper and pounds of glass and paper delivered (Figures 5 and 6) represent controls for random fluctuations in the aluminum data.

When graphing the data in Figure 4, 5, and 6, if data from one of the days were missing, "reliability" observations made on the next day for the previous day's data were substituted, when available (about 1/3 of the time). However, when the data were not available, the week's data point was calculated by adding data for the days that data were available, dividing by the number of days, and multiplying by 5. This ensured that each data point was based on the equivalent of 5 days of data.

As can be seen in Figure 4, except for the raffles, none of the interventions substantially increased either the number of aluminum can deliveries or the number of cans delivered. The first raffle increased both dependent variables for Building I but, for the other three buildings, it did not appear to have increased levels of the dependent variables above background noise. In contrast, the airplane ticket raffle resulted in dramatic increases in both dependent variables in each of the buildings. Figures 5 and 6 suggest that none of the interventions increased number of deliveries

or weight of glass or newspaper over background noise in any of the buildings.

Person Variables and Recycling

Often researchers investigating person variables and participation in recycling programs rely on self-reported participation to classify subjects. In this study, both behavioral measures and self-reported participation were collected. In the current research, the author hoped to have a unique opportunity to investigate the relationship between actual participation in a recycling program and certain person variables. Unfortunately, employees did not write identifying information on a large percentage of the bags of recyclables they delivered to the CRC, thus limiting the conclusions that could be made regarding relationships between person variables and recycling behavior. Employees did not include identifying information for 36% of the can deliveries, 52% of the newspaper deliveries, and 47% of the glass deliveries.

As a group, the CRC employees who responded to the questionnaire appeared to be greatly concerned about the environment and believed they had personal control over what happens to it. Specifically, when averaged over all Environmental Concern items, 83% +/- 15% of employees (mean +/- s.d.) responded to items in a pro-environment

direction (representing environmental concern)¹¹. Furthermore, 92% +/- 6% of employees (mean +/-s.d.) responded to Environmental Locus of Control items in an internal direction. For example, the percentage of employees responding to representative questions in a moderately or strongly pro-environment direction were as follows: 94% disagreed with the statement "The benefits of modern consumer products are more important than the pollution that results from their production and use;" 93% indicated that "I'd be willing to make personal sacrifices for the sake of slowing down pollution even though the immediate results may not seem significant;" and 68% agreed that "I would be willing to accept an increase in my family's expenses of \$100 next year to promote the wise use of natural resources."

Cronbach's coefficient alphas were calculated for each scale for the population studied in the current research. ELOC, Environmental Concern Scale, LOT, Psychological Reactance Scale, self-reported recycling items, and the abbreviated Personal and Political Control Factors of the Rotter I-E Scale had the following coefficients, respectively: .90, .83, .82, .76, .76, .35, and .14. Since the abbreviated Personal and Political Control Factors of the Rotter I-E

¹¹ An employee's response was classified as pro-environmental when responses 4, 5, or 6 corresponding to the item in the questionnaire booklet was circled, on items worded in a pro-environmental direction; or when 1, 2, or 3 was circled, on items worded in an anti-environmental direction.

Scale were not internally consistent in this population, they were omitted from further calculations. All of the other scales demonstrated acceptable levels of internal consistency.

Environmental Locus of Control Scale (ELOC)

Each item on the ELOC was correlated with the total ELOC score to determine whether any of the items were highly redundant with the rest of the scale or if any were not measuring the phenomenon of interest (see Appendix L for the item-total correlation coefficients). Of the 19 items on the scale, 18 had coefficients between 0.40 and 0.80, suggesting all but one item contributed in a unique but non-redundant fashion. Item number 57 had a correlation of only -0.07 with the total scale; it was therefore omitted from subsequent analyses.

Concurrent and Discriminative Validity of the ELOC

Pearson product-moment correlations between the ELOC and the other scales are presented in Table 3 for all employees who returned

questionnaires (N=211). An alpha of .01 was used as the cutoff for reliability¹².

Table 3 indicates the predicted relationships with the ELOC Scale. The ELOC had moderately high and reliable positive correlations with the Environmental Concern Scale and the LOT (Life Orientation Test; measuring optimism). This suggests that the ELOC scale is measuring a somewhat related construct to both of these scales, but it is not highly redundant with them. In addition, the ELOC had a moderately high and negative correlation with the Psychological Reactance Scale suggesting that people who believe they are able to affect environmental consequences personally (i.e., "internals") are likely to perceive themselves as having more personal freedom than people who have an external locus of environmental control.

¹² This study performed eleven statistical tests. Bonferroni suggests that in order to reduce the probability of making Type I errors (i.e., finding "reliable" differences by chance), researchers should divide alpha by the number of statistical tests performed in a study. In the current study, this procedure would result in an alpha cutoff of .004 (i.e., $0.05/11 = .004$). However, most statisticians agree that when there is a large number of statistical tests, Bonferroni's Correction is too conservative. As a result, it was decided to use a compromise cutoff of .01 (see Hayes, 1981 for a discussion of this issue).

Table 3. Pearson correlation coefficients between Environmental Locus of Control Scale and other person variable scales (ELOC = environmental locus of control; CONCERN = Environmental concern; LOT = Life Orientation Test; REACT = Merz's Psychological Reactance Scale).

Correlations:	*ELOC	CONCERN	LOT
CONCERN	.6493		
	(185)		
	P= .000		
LOT	.3545	.1234	
	(193)	(187)	
	P= .000	P= .046	
REACT	-.2584	-.0762	-.1762
	(181)	(177)	(185)
	P= .000	P= .157	P= .008

(Coefficient / (Cases) / 1-tailed Significance)

*High scores on the ELOC represent an internal locus of environmental control.

Relationship between Criteria Scores and Person Variables

The criteria which the author hoped to predict were: (a) the number of recyclable deliveries to the CRC ("DELIVER") and (b) the self-reported number of different types of recyclables delivered to any recycling center at least once per month prior to the introduction of the CRC program ("RECYRPT"). Table 4A displays the correlations between person variables and criteria variables for all employees returning questionnaires (i.e., full sample). In contrast, Table 4B shows the correlation coefficients between person variables and criteria variables for the subsample of employees returning questionnaires who did not receive curbside service ("No Curb" subsample). The correlation coefficients for the "No Curb" subsample are shown separately because the subsample's delivery of recyclables to the CRC (i.e., a criterion) is not confounded by curbside use, as is the case for the full sample of employees. The Spearman Rank-Order Correlation procedure was used to calculate correlations between the criteria variables and the person variables since the distributions of the criteria variables were non-normal. As can be seen in Tables 4A and 4B, the pattern of correlations for the full sample and the "No Curb" subsample were identical. More specifically, each of the correlations between number of recyclable deliveries (DELIVER) and the scale scores was small and non-reliable (at $\alpha < .01$). In contrast, the self-report measure of recycling

Table 4A. Spearman Correlation Coefficients for the full sample of employees to determine the relationships between criteria and scale scores (ELOC = environmental locus of control; CONCERN = Environmental concern; LOT = Life Orientation Test; REACT = Merz's Psychological Reactance Scale; DELIVER = number of recyclable deliveries to the CRC; RECYRPT = self-reported number of different types of recyclables delivered by the employee on a regular basis prior to the introduction of the CRC program prior to the introduction of the CRC program).

Correlations:	*ELOC	CONCERN	LOT	REACT	RECYRPT
RECYRPT	.3181	.2225	.1467	-.0657	
	(169)	(199)	(203)	(207)	
	P= .000	P= .001	P= .018	P= .174	
DELIVER	.1112	.0810	.0449	-.0914	.0699
	(169)	(199)	(203)	(207)	(211)
	P= .075	P= .128	P= .262	P= .095	P= .156

(Coefficient / (Cases) / 1-tailed Significance)

*High scores on the ELOC represent an internal locus of environmental control.

Table 4B. Spearman Correlation Coefficients for the "No Curb" subsample to determine the relationships between criteria and scale scores (ELOC = environmental locus of control; CONCERN = Environmental concern; LOT = Life Orientation Test; REACT = Merz's Psychological Reactance Scale; DELIVER = number of recyclable deliveries to the CRC RECYRPT = self-reported number of different types of recyclables delivered by the employee on a regular basis prior to the introduction of the CRC program).

Correlations:	*ELOC	CONCERN	LOT	REACT	RECYRPT
RECYRPT	.3452	.1903	.1405	-.0294	
	(131)	(125)	(133)	(126)	
	P= .000	P= .017	P= .053	P= .372	
DELIVER	.1099	.0941	.1447	-.1746	.1674
	(129)	(123)	(131)	(125)	(134)
	P= .107	P= .150	P= .050	P= .026	P= .027

(Coefficient / (Cases) / 1-tailed Significance)

*High scores on the ELOC represent an internal locus of environmental control.

behavior prior to the introduction of the CRC program (RECYRPT) showed a moderately high correlation with the ELOC.

Table 5 shows the mean for each scale in the questionnaire for the "No Curb" employees. Employees were divided based on frequency of participation in the CRC program into "Non-Participants," employees not delivering any recyclables to the CRC; "Infrequent Participants," those delivering recyclables to the CRC once or twice; and "Frequent Participants," those delivering recyclables to the CRC three or more times. As can be seen, the standard deviations for the scales were large compared with the differences in means between the groups. The patterns of scores for the "No Curb" subsample and for the full sample of employees (exhibited in Appendix M) were identical.

Since the number of employees in the different frequency-of-participation groups were extremely unequal (e.g., 97 vs. 18 vs. 14), parametric statistics were deemed inappropriate for testing the differences between these groups. Instead, Chi-Square tests were used. 2 Score Levels (High vs. Low) X 3 Participation Levels (Non-Participants vs. Infrequent Participants vs. Frequent Participants) Chi-Square tests were performed for each scale except the LOT.

Three LOT score levels were required as a result of the predicted curvilinear relationship between recycling and optimism (i.e., those

Table 5. Mean scores for the "No Curb" subsample by frequency-of-participation levles (ELOC = environmental locus of control; LOT = Life Orientation Test, measuring optimism; CONCERN = Environmental concern; REACT = Merz's Psychological Reactance Scale; RECYRPT = self-reported number of different types of recyclables delivered by the employee on a regular basis prior to the introduction of the CRC program).

	CRC RECYCLING STATUS											
	NON-PARTICIPANTS			INFREQUENT PARTICIPANTS		FREQUENT PARTICIPANTS						
	MEAN	(SD)	N	MEAN	(SD)	N	MEAN	(SD)	N			
ELOC*	63.4	(10.4)	97	62.7	(9.9)	18	67.8	(11.2)	14			
LOT	25.0	(5.2)	99	26.2	(4.6)	20	27.6	(3.7)	14			
CONCERN	53.1	(8.8)	92	52.9	(10.2)	19	56.6	(8.1)	14			
REACT	39.2	(6.3)	94	37.9	(8.0)	19	36.5	(4.8)	13			
RECYRPT	2.6	(2.3)	102	3.2	(2.4)	20	3.8	(1.9)	14			

*High scores were coded as being in the internal direction.

with medium scores would recycle more than those with high or low scores). Thus, a 3 Score Levels (High vs. Medium vs. Low) X 3 Participation Levels (Non-Participants vs. Infrequent Participants vs. Frequent Participants) Chi-Square test was performed for the LOT. For all scales but the LOT, the high/low cutoff score was the mean score for all of the employees responding to the questionnaire. For the LOT, high, medium, and low cutoff scores were calculated by: (a) pooling the LOT scores of all employees responding to the questionnaire, (b) ordering the scores from high to low, (c) dividing the scores into three groups with equal numbers of employees, and (d) selecting the scores at the group divisions as cutoffs. Cross-tabulation tables for each Chi-Square test are shown in Appendices N-1 and N-2 for the full CRC sample and the "No Curb" subsample, respectively.

The p-values for the Chi-Square tests for both the full sample and the "No Curb" subsample of employees for each scale are shown in Table 6. For both the full sample and the "No Curb" subsample, the Psychological Reactance Scale scores were dependent on frequency of participation in the CRC program. As can be seen in Figure 7, this reflects the presence among the Non-Participant Group of fewer low scorers and more high scorers than expected by chance, and the presence among both the Infrequent and Frequent Participants of more low scorers and fewer high scorers than expected (see Appendices N-1

Table 6. P-values for Chi-Square Tests of independence between scores on each questionnaire scale and CRC participation for the full sample of employees and for the "No Curb" subsample. (ELOC = environmental locus of control; LOT = Life Orientation Test, measuring optimism; CONCERN = Environmental concern; RECYRPT = self-reported number of different types of recyclables delivered by the employee on a regular basis prior to the introduction of the CRC program).

	FULL		NO CURB	
	P-VALUE	N	P-VALUE	N
ELOC	.02	197	.09	129
OPTIMISM	.31	202	.16	133
CONCERN	.11	191	.10	115
REACTANCE	.01	188	.01	126
RECYRPT	.30	211	.05	136

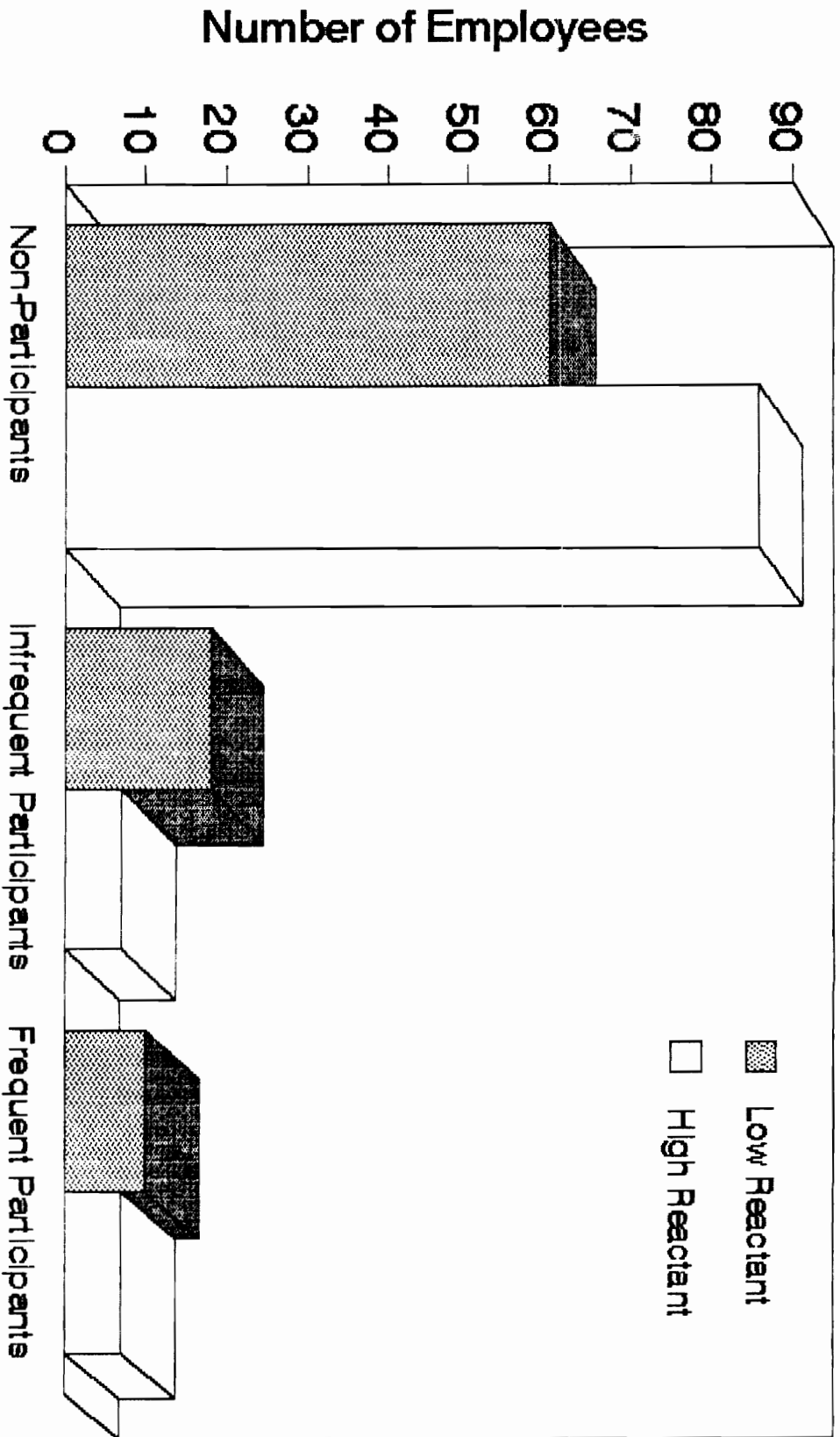


Figure 7. Number of employees with low and high psychological reactance scores at different participation levels (full CRC sample).

and N-2 for the relevant cross tabulation tables). In addition, for both the full sample and subsample, there were non-reliable trends suggesting that ELOC and Environmental Concern were dependent on frequency of participation. These trends indicated that relative to chance, Frequent Participants were underrepresented by low scorers and overrepresented by high scorers. Finally, for the "No Curb" subsample, there was a non-reliable trend for CRC participation to depend on self-reported recycling prior to the introduction of the CRC program (RECYRPT) suggesting that Frequent Participants were underrepresented by low scorers on the self-report measure and overrepresented by high scorers.

DISCUSSION

Intervention Techniques

With the exception of the raffle contingency for aluminum cans, participation rates during both non-intervention and intervention phases of this study were extremely low¹³. The finding that consequences were more motivating than antecedent interventions corroborates much other research (see Geller et al., 1975; Ingram & Geller, 1975; Witmer & Geller, 1976; Hamad et al., 1977).

The low levels of participation found in this research were probably the result of a variety of factors. First, one half to two thirds of the targeted population received curbside recycling service, rendering delivery of recyclables to the CRC inconvenient for them. In fact, the convenience of the curbside program is evidenced by very high participation rates. Estimates indicate that at least 40% of Blacksburg homes participate on any given collection day, and per month, approximately 80% of homes participate at least once (E.S. Geller, personal communication, October 17, 1991).

¹³ It is interesting to note that of the 5824 cans that were delivered to the CRC during data collection, almost 20% (1005 cans) were delivered by a single employee during the airline raffle intervention. This employee reported that he was a member of a university fraternity; he and his fraternity brothers had been collecting cans for recycling for several months, long before they knew that the CRC would hold a raffle for cans. In other words, many of the cans that were collected at the CRC during the raffle would have been recycled anyway.

Second, the employees predisposed to engaging in pro-environment behaviors were also most likely to have curbside service, reducing the likelihood that they would participate in the CRC program. Income has been shown to be positively related to participation in recycling programs (e.g., Jacobs et al., 1984), and recipients of Blacksburg curbside service were likely to have higher incomes than those not receiving curbside¹⁴.

Third, for the employees not receiving curbside, bringing recyclables to work would have been more convenient than bringing them to collection centers in town. However, bringing recyclables to work does have response costs. For example, employees would need to spend time and exert effort preparing recyclables and loading their vehicles with them. In addition, carrying recyclables to the CRC collection bins may have required employees to make extra trips to their vehicles especially if they were carrying other items to work (e.g., a briefcase).

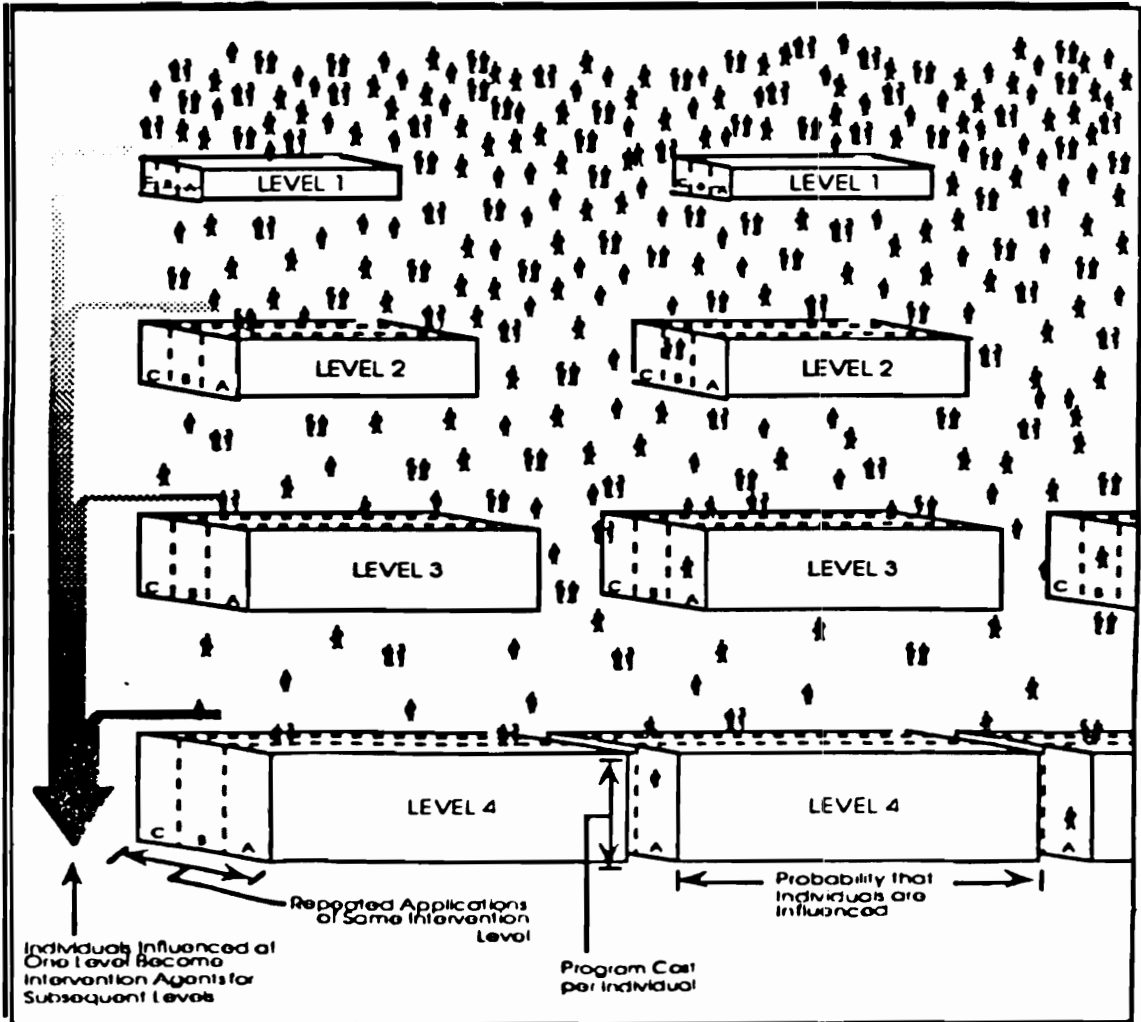
Fourth, although the current study used intervention techniques that previously have resulted in increases in pro-environment behavior, the current study used them in a low-cost, impersonal fashion. A major goal of this research was to determine whether

¹⁴ Real estate values in Blacksburg are higher than in surrounding areas, and employees owning homes in Blacksburg are likely to have higher incomes than employees renting apartments (where curbside was not available).

impersonal, high-tech communication methods which require little time and effort could be effective at disseminating information to motivate employees to engage in non-work-related pro-social behavior. Figure 8 shows the Multiple Intervention Level Hierarchy Model (Geller, Needleman, & Randall, 1990b). According to this model, interventions may be classified as belonging to one of multiple tiers or levels, each defined by the cost of the intervention (i.e., time, effort, resources) per targeted individual. The model predicts that as the per-capita cost increases, the intervention's ability to influence individuals also increases. At the top of the hierarchy (i.e., Level 1), the interventions are least costly per individual and target the maximum number of people. Individuals who are not influenced by the first exposure to a particular intervention level will "fall through the cracks" and be uninfluenced by repeated exposure to interventions at the same level. According to the model, these individuals require a more influential (higher level) intervention. In the current study, all of the interventions except the raffles would be classified as Level 1 interventions, whereas the raffles would be classified as a higher level intervention -- costing more per capita.

A fifth factor that may have contributed to the low participation rates was that the intervention messages were both temporally and geographically removed from the targeted behaviors. Employees

Figure 8. A multiple intervention level hierarchy differentiating repeated interventions at the same effectiveness level from interventions that are progressively more influential at changing behavior. The height and width of each intervention level increases progressively from levels 1 to 4 in order to denote successively increasing amounts of intervention effectiveness and cost per program participant.



received intervention messages at work, but the preparation and transportation of recyclables would have to occur during non-work hours in non-work locations. According to Geller (in press), "To be most effective, behavior change messages should occur in close proximity to opportunities to emit the desired . . . target behavior" (p. 9).

While the above factors may have contributed to the low participation rates, non-participation is also likely to be the result of the nature of the target behavior. Research has shown repeatedly that it is difficult to motivate people to initiate and maintain pro-social behaviors unless the social problem has a direct effect on their lives (e.g., landfill closes, increased cancer rates in their community). In the field of environmental protection, while intervention techniques have at times markedly increased pro-environment behavior over low baseline levels, typically only 10% to 15% of eligible subjects have participated during or subsequent to the interventions.

Why is it so difficult to motivate people to act pro-environmentally? On a personal level exploiting the environment provides many tangible benefits -- convenience, low cost, comfort, and status. Who among us is ready to give up fast-food meals, Xerox copies, microwave ovens, VCRs, televisions, stereos, dishwashers, garbage disposals, air conditioners, automobiles, and exotic

vacations? Even if we were willing to make personal sacrifices, environmental problems are so extensive that we would not be able to see the beneficial impact of our own pro-environment behavior. For instance, if I sacrifice my comfort and do without air conditioning, I will not be able to detect the effects on the world's energy supply, levels of air pollution, or electricity costs. Thus, if people are to act in a pro-environment fashion, it must be for either philosophical/altruistic reasons or because they feel the direct effects of environmental degradation on their own lives.

Skinner (1987) held that people do not act to save the planet because the necessary behaviors are not selected by the environment. Moreover, he suggested that dire predictions regarding a distant future are unlikely to change our current behavior, since

we have more often been successful when we have followed the advice about the immediate future because that kind of advice has been more often tested and found better (p. 5).

In addition, when predictions about the future are negative or punishing we try to escape them. An easy escape is to try not to think about the predicted future.

Skinner suggested that in order to save the planet, the powerful societal institutions that control much of human behavior (i.e., governments, religions, political systems) would have to arrange immediate personal consequences to reflect long-term global

consequences. For example, religious institutions could label people who excessively deplete environmental resources as "sinners." Governments could call them "criminals." In addition, governments could heavily tax gasoline to decrease consumer use of fuel, and the money could be used to fund research on renewable energy sources. Unfortunately, the contingencies that dictate the behavior of powerful institutions are often incompatible with the survival of the species and the health of the natural environment. For example, politicians are motivated to be elected or stay in office and therefore will usually not support unpopular legislation such as a gasoline tax. Moreover,

Nuclear weapons are made to guarantee the survival of governments and religions, not the species. Governments and religions estimate their strength in the sheer number of their supporters and are therefore 'prolife.' (China may seem to be an exception, but overpopulation was already severe; the future had arrived; Skinner, 1987, p. 7).

In summary, there are a variety of factors that may have led to both low participation rates in the current study and low involvement in pro-social behaviors in general.

Person Variables

As predicted, employees with low Psychological Reactance scores delivered recyclables reliably more frequently than employees with

high scores, indicating that employees who perceived that their personal freedom was threatened less often and/or in fewer situations were more likely to participate in a recycling program. Presumably, employees who were highly reactant viewed the program as threatening their freedom and therefore attempted to regain freedom by not participating. However, it should be noted that the overlap in Psychological Reactance scores between non-participants, infrequent participants, and frequent participants was sufficiently large to make accurate prediction of participation frequency impossible. None of the other person variables reliably discriminated participants from non-participants.

The Environmental Locus of Control Scale (ELOC), developed for the current research, showed the expected patterns of correlations with other scales, suggesting concurrent and discriminative validity. In addition, it tended to be related to the frequency with which employees participated in the CRC program. But again, the overlap between ELOC scores for the "Non-Participants," "Infrequent Participants," and "Frequent Participants" was great, limiting the predictive utility of the scale. Perhaps, designing the questionnaire to account for the suggestions made in the following paragraphs will increase the predictive utility of this and other scales.

A possible reason for the failure of person variables to predict recycling deliveries in the current study may have been an artifact of the design. Employees failed to write identifying information on approximately 50% of the bags of recyclables they delivered at the CRC. It is possible that employees who delivered recyclables and did not identify themselves differed from employees who did not participate in the program in some systematic way. Other explanations for the failure of person variables to predict participation in the recycling project include: (a) people's tendency to bias their verbal behavior in a socially desirable manner, (b) failure of questionnaire items to require employees to consider pro-environment behaviors in light of personal costs, and (c) the indirect relationship between the attitudes and the target behaviors. It is well known that people's non-verbal behavior is often inconsistent with self-reported behavior, the attitudes people express, and the personal characteristics they attribute to themselves (see Hall & Hall, 1974; Knapper & Cropley, 1981; Leon & Roth, 1977; Mischel, 1984; Mischel & Peak, 1982; for relevant articles and studies).

The first explanation for the attitude-behavior discrepancy is that people desire to be viewed as subscribing to socially desirable attitudes and as behaving in a socially desirable fashion (see Edwards, 1957). Since societal norms currently support environmental causes, CRC employees are likely to indicate that they have pro-

environment attitudes even if environmental issues are not of great personal concern to them.

Another explanation relates to the relative values people place on protecting the environment and its costs. While most people probably would not find degrading the environment rewarding per se, they may prefer it to the costs of preserving the environment. Thus, questionnaire items that inquire about the value people place on preserving the environment relative to the personal costs associated with it may result in better predictions of pro-environment behaviors (e.g., "In order to reduce the amount of natural resources you use and the waste you create, are you willing to cut in half the frequency with which you eat at fast-food restaurants;" "Would you be willing to spend \$11 instead of \$10 for a box of computer paper?").

A third reason for the attitude-behavior discrepancy may have to do with the indirect relationship between the attitudes and the target behaviors they are intended to predict. Ajzen (1988) has suggested that attitudes towards a behavior and subjective norms do not directly affect the likelihood that a person will engage in a behavior. Rather, each contributes to a person's intention to perform the behavior. Intentions directly influence the likelihood that the person will perform the behavior. Ajzen (1988) reviewed several studies (Ajzen, 1971; Ajzen & Fishbein, 1980; Ajzen, Timko, & White, 1982; King, 1975; Manstead, Proffitt, & Smart, 1983; Smetana &

Adler, 1980; Vinokur-Kaplan, 1978) in which attitudes towards a behavior and subjective norms were regressed on intention to perform a target behavior. Target behaviors included: cooperation in Prisoner's Dilemma game, having an abortion, using birth control pills, smoking marijuana, joining an alcoholic treatment unit, choosing a particular brand of beer, and so on. While attitudes towards the behavior and subjective norms had low correlations with the actual behavior (i.e., about 0.30), attitudes and norms were highly correlated with intentions to act in a particular manner (multiple correlation coefficients were between 0.72 to 0.96). Moreover, intentions to perform the behavior and the actual behavior had high correlations (about 0.80). Thus, the current research may have made better predictions of employees' participation in the CRC project had it simply asked employees if they intended to participate.

Future Directions

Increasing Participation in Recycling Programs

Recycling participation rates in a corporate setting might be increased if interventions are disseminated in a more personal fashion (representing a higher intervention level on the Multiple Intervention Level Hierarchy Model, Figure 8). Members of service organizations might be particularly helpful in supplying the people-power for such an approach. The current study found that volunteers

are readily available to help in recycling projects. Several university organizations transported recyclables from the CRC to local recycling centers. In addition, college students gaining research experience collected data for the project. In future projects, volunteers could contact individual employees and make appeals, give small gifts and ask that employees participate, and so on.

A second approach to increasing participation in a corporate-based recycling program would be to target work-generated recyclables. This would decrease employees' response costs and increase the proximity of the interventions to the targeted recycling behaviors. Humphrey et al. (1977) found that employees salvaged approximately 90% of used office paper when containers provided for collecting recyclable paper were readily available. Another approach might be to solicit employees who already participated in the program to talk with their colleagues about participating. Those who already participated are likely to be more committed to recycling and might therefore become involved in recruiting others. (This differs from the approach used in the current study. Regardless of whether they participated, employees who received phone mail at Building III were asked to disseminate program-related information to their co-workers who did not receive phone mail.)

A third procedure that may increase participation in a corporate-based recycling program that targets home-generated recyclables would be to give each employee a container with separate compartments for each type of recyclable and that would fit in the trunk of their car (E.S. Geller, personal communication, March, 1990). This might increase the convenience of preparing, storing, and transporting recyclables.

A final strategy that might increase participation in a recycling program would be to sequence interventions in an effort to initially recruit as many participants as possible followed by efforts to maintain high levels of participation. For example, raffles might be introduced first and repeated several times. Starting off with raffles or other potent interventions may have a variety of benefits, including the following: members of the targeted population may find that participating is more convenient than expected; they may develop a habit of participating; and their attitudes towards recycling may become more positive increasing the likelihood that they participate subsequently (Bem, 1972). Later interventions could be less costly

and focus on reminding employees about the program and keeping them interested¹⁵.

Predicting Behavior from Questionnaire Data

Unlike most studies that assessed person variables and pro-environment behavior, this study attempted to compare person variables with actual behavior as opposed to self-reported behavior. Measuring actual behavior is important since people's self-report is often inaccurate (see Kanfer & Gaelick, 1986). Unfortunately, in the current study, tracking individuals' behavior depended on employees' compliance, and results indicated that without incentives (i.e., raffles), a large proportion of employees did not write identifying information on bags of recyclables. In future studies, it would be beneficial for the experimenter to track recycling behavior without the help of the targeted population. (An added benefit of such an approach would be its non-intrusiveness.) For example, researchers could easily study participation in a curbside program by following the collection truck over a particular route on a regular basis and recording the frequency with which each house placed its bin on the

¹⁵ If this strategy were found to be more effective than introducing the raffle as the last intervention, it would provide evidence against the Multiple Intervention Level Hierarchy Model, since the model suggests that the cost of an intervention (i.e., its level), not its sequence of introduction or the number of repetitions, determines its efficacy.

curb. Each house could also receive a questionnaire that assessed person variables.

In order to minimize the effects of people responding in a socially desirable manner to questionnaire items, a social desirability scale (e.g., Desirability Scale of the Personality Research Form; Jackson, 1984) could be embedded in questionnaires and used to correct scores on other scales statistically. That is, social desirability scores could be covaried out of the other scores. More accurate predictions might also be made if a scale were designed to assess the value people place on preserving the environment relative to the personal costs associated with it. In addition, another scale could inquire directly about people's intentions for preparing and transporting recyclables. Finally, social norms (see Manzo & Weinstein, 1987) and social responsibility (see Berkowitz & Daniels, 1964; Berkowitz & Lutterman, 1968) show promise for predicting pro-environment activities and warrant investigation.

Beneficial Effects of the Current Research

The current research replicated findings of other studies that attempted to motivate pro-social behaviors and studies that attempted to predict behavior based on responses to questionnaire items. Specifically, the current study found: low participation rates in pro-social behavior, that using consequences were more effective than antecedent interventions, and that people's behavior could not be

predicted from their responses to questionnaire items that queried about recycling behavior, attitudes, and person variables.

In addition to replicating other findings, the current project may have helped disseminate pro-environment attitudes to the community. The author was interviewed by a statewide radio news network that distributed information about the program to dozens of radio stations. In addition, Virginia Tech's student newspaper and a faculty newsletter ran the story¹⁶. Finally, many employees used the author as a source of information to find out about recycling opportunities in the community¹⁷.

Concluding Comment

Although multiple factors are likely to contribute to people exploiting the environment, there is hope. One reason for hope is that people are beginning to feel the consequences of environmentally destructive behavior and this is beginning to change their behavior. The media has given extensive coverage to communities (e.g., Love Canal, N.Y. and Times Beach, MO) that have been devastated by toxic

¹⁶ The interviews were conducted prior to analyzing the data. In retrospect, this was desirable since low participation rates were not reported and therefore not modeled for the community.

¹⁷ Interestingly, only employees in Building I, which received program information through electronic mail, sent messages inquiring about other recycling opportunities and asking for clarification regarding procedures in the current program. This suggests that electronic mail may be advantageous for disseminating information about pro-social behavior since it permits dialogue.

waste. Landfills are closing all over the country causing the cost of waste disposal to sky rocket. As a result, laws are being passed, curbside recycling programs are being implemented all over the country, fast-food restaurants are beginning to use less styrofoam, and so on.

A related reason that people may change their behavior is that pro-environment behavior is beginning to elicit social reinforcement. Since people have begun to feel the impact of environmental destruction, they are currently more likely to praise and be praised for protecting the environment than they were five years ago. Most people respond to praise by increasing the frequency with which they perform the behavior for which they are being praised (i.e., praise is reinforcing for most people). As a result, in the near future, being praised for pro-environment behavior should increase its frequency.

In addition, social reinforcement may eventually result in pro-environment behavior becoming a reinforcer in and of itself for many people. Objects, behaviors, and situations can acquire the ability to reinforce people's behavior. Primary reinforcers are those that satisfy physiological needs and safeguard the propagation of the species. For instance, food and sex are considered primary reinforcers. Other objects, behaviors, or situations do not satisfy physiological needs but can acquire the ability to reinforce by

preceding other reinforcers and becoming associated with them. These are known as higher-order reinforcers. Examples include smiles and money. At a young age, smiles become reinforcing for infants because smiles are associated with nurturing behavior from caregivers. Money becomes associated with material reinforcers and also becomes a strong reinforcer. Thus, while pro-environment behaviors are not primary reinforcers, they could become higher-order reinforcers if they are consistently associated with reinforcers such as social reinforcement. Finally, as more people behave in a pro-environment fashion, more role models for this behavior are available which in turn should elicit more people to behave in kind.

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APPENDIX A-1: Inquiry Regarding Curbside Status

To: XXX
From: Larry Needleman
Date: XXX
Subject:

Tech's department of psychology is studying recycling behavior. The Computing Center and the Communications Resources Center support our interest in recycling and have given us permission to begin a recycling program at the XXX [Building I's name]. However, starting on September 3rd in Blacksburg, home owners will have the opportunity to have recyclables picked up from their curb on a weekly basis. Before beginning a program at the Information Systems Building, we need to determine whether enough employees at the building will NOT have curbside recycling available to them.

A single-word message from you will help us determine whether it will be worthwhile to start a program in your building.

Please send the word NOCURB to DANEEDELE @ VTVM1 by Friday if you live outside of Blacksburg or in an apartment in Blacksburg.

Please send the word CURB to DANEEDELE @ VTVM1 by Friday if you live in a house in Blacksburg.

Thank you.

APPENDIX A-2: Details Regarding the Recycling Program

RECYCLING WILL BEGIN AT THE XXX [Building I's name] THIS WEEK!!!

INFORMATION REQUESTED

Please let me know by Wednesday (August 8) when you typically arrive & leave work so that we can have regular collection times that accommodate the most people possible (e.g., ARRIVE: 8 AM; LEAVE: 5 PM).

FIRST WEEK (AUG 6-10) COLLECTION TIMES

Recyclables will be collected this Tuesday morning at 7:45-9 a.m. & Thursday afternoon at 3:45-5 p.m. in the parking lot on a grass islands close to the downstairs entrance side of the building. These times may be changed in subsequent weeks to accommodate your work schedules.

COLLECTION PROCEDURES

At the beginning of the project, we will only collect aluminum cans & clear glass. (However, in about a month, we will be able to accept newspapers).

When you bring in materials, please prepare them in the following manner:

- 1) rinse glass jars & bottles,
- 2) remove caps from jars & bottles, and
- 3) make sure aluminum cans are empty & crush them.

(It is NOT necessary to remove labels from jars & bottles).

When I receive recyclables from you, I will weigh them & ask you for your USERID. We will need your USERID for tracking how much recyclable material individual employees are bringing in, what percentage of employees are doing the majority of recycling, and so on. Being able to keep track of who is recycling is extremely important to our research. Therefore, your cooperation would be greatly appreciated.

CONFIDENTIALITY

Information regarding the amount of recyclables you bring in will be completely confidential. It will NOT be made available to your employer or to anyone other than the people conducting the research. Findings from the study will be reported in the aggregate or, if individual data is reported, it will not be associated with identifying information.

I look forward to seeing you (& your recyclables!) on Tuesday & Thursday. Please remember to let me know when you usually get to & leave work so that I can set up collection times that are convenient for you.

By the way, thanks for responding to my CURB/NOCURB message!

APPENDIX A-3: Reminder Message

[Building I's name] RECYCLING

Location: grass island in the parking lot towards the side of the building with the downstairs entrance.

Rain Location: loading dock

Times: Tuesdays 7:30 - 8:45 a.m.
Thursdays 4:30 - 5:45 p.m.

Materials: clear glass jars and bottles & aluminum cans

Preparation of Materials:

- 1) separate glass and aluminum
- 2) rinse glass jars & bottles,
- 3) remove caps from jars & bottles, and
- 4) make sure aluminum cans are empty & crush them.
(It is NOT necessary to remove labels from jars & bottles).

Thank you!



Win Cash Prizes!



Contribute to Understanding Environmental Concern!

By filling out and returning the attached questionnaire, you will be helping researchers at VA Tech understand relationships between environmental concern, attitudes, and personality, AND you will be automatically entered into a cash lottery. Your chances of winning a prize are better than 1 in 40. At the CRC, two \$50, four \$25, and five \$10 prizes will be awarded.

Please put your questionnaire in the envelope provided, and return it to the front desk of your building. Please return this questionnaire by Friday, October 18th. Winners will be posted on Friday, October 25th. Thanks for your help!

APPENDIX C: Attitudinal and personality scales
used in the project

- C-1. (Intact) Rotter Internal-External Control Scale (Rotter, 1966);
p. 146.
- C-2. Environmental Locus of Control (see p. 137; Needleman & Geller,
unpublished); p. 149.
- C-3. Life Orientation Test for testing optimism/pessimism (Scheier &
Carver, 1985); p. 151.
- C-4. Merz's Psychological Reactance Scale (Tucker & Byers, 1987);
p. 152.
- C-5. Environmental Concern Scale (Weigel & Weigel, 1978); p. 154.
- C-6. Miscellaneous Items; p. 156.

APPENDIX C-1: (Intact) Rotter Internal-External Control Scale

- 1.a. Children get into trouble because their parents punish them too much.
- b. The trouble with most children nowadays is that their parents are too easy with them.
- 2.a. Many of the unhappy things in people's lives are partly due to bad luck.
- b. People's misfortunes result from the mistakes they make.
- 3.a. One of the major reasons why we have wars is because people don't take enough interest in politics.
- b. There will always be wars, no matter how hard people try to prevent them.
- 4.a. In the long run people get the respect they deserve in this world.
- b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
- 5.a. The idea that teachers are unfair to students is nonsense.
- b. Most students don't realize the extent to which their grades are influenced by accidental happenings.
- 6.a. Without the right breaks one cannot be an effective leader.
- b. Capable people who fail to become leaders have not taken advantage of their opportunities.
- 7.a. No matter how hard you try some people just don't like you.
- b. People who can't get others to like them don't understand how to get along with others.
- 8.a. Heredity plays the major role in determining one's personality.
- b. It is one's experiences in life which determine what they're like.
- 9.a. I have often found that what is going to happen will happen.
- b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
- 10.a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
- b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

- 11.a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
- b. Getting a good job depends mainly on being in the right place at the right time.
- 12.a. The average citizen can have an influence in government decisions.
- b. This world is run by the few people in power, and there is not much the little guy can do about it.
- 13.a. When I make plans, I am almost certain that I can make them work.
- b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
- 14.a. There are certain people who are just no good.
- b. There is some good in everybody.
- 15.a. In my case getting what I want has little or nothing to do with luck.
- b. Many times we might just as well decide what to do by flipping a coin.
- 16.a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
- b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.
- 17.a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
- b. By taking an active part in political and social affairs the people can control world events.
- 18.a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
- b. There really is no such thing as "luck."
- 19.a. One should always be willing to admit mistakes.
- b. It is usually best to cover up one's mistakes.
- 20.a. It is hard to know whether or not a person really likes you.
- b. How many friends you have depends upon how nice a person you are.

- 21.a. In the long run the bad things that happen to us are balanced by the good ones.
- b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

- 22.a. With enough effort we can wipe out political corruption.
- b. It is difficult for people to have much control over the things politicians do in office.

- 23.a. Sometimes I can't understand how teachers arrive at the grades they give.
- b. There is a direct connection between how hard I study and the grades I get.

- 24.a. A good leader expects people to decide for themselves what they should do.
- b. A good leader makes it clear to everybody what their jobs are.

- 25.a. Many times I feel that I have little influence over the things that happen to me.
- b. It is impossible for me to believe that chance or luck plays an important role in my life.

- 26.a. People are lonely because they don't try to be friendly.
- b. There's not much use in trying too hard to please people, if they like you, they like you.

- 27.a. There is too much emphasis on athletics in high school.
- b. Team sports are an excellent way to build character.

- 28.a. What happens to me is my own doing.
- b. Sometimes I feel that I don't have enough control over the direction my life is taking.

- 29.a. Most of the time I can't understand why politicians behave the way they do.
- b. In the long run the people are responsible for bad government on a national as well as on a local level.

APPENDIX C-2: Environmental Locus of Control

1. There is a lot I can do to lessen the energy crisis.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

2. When you try to do something to protect the environment, it's likely to result in other unintended negative environmental consequences. Therefore it's probably best not to do anything to protect the environment.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

3. Environmental problems are too complicated for the average person to understand.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

4. If I were to recycle, it wouldn't really save natural resources.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

5. At best, recycling only postpones the inevitable.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

6. Environmental problems can only get better if large companies do something about them.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

7. Only people who are more persuasive and energetic than I can really do things that will save our natural resources and cause less pollution.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

8. Children should learn what they can do for the environment so the next generation will produce less waste, save more energy, and have less pollution.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

9. If I recycle, I'm setting a good example for others to follow.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
			5
			6

10. Only people in government and technical fields can do anything to save the planet.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

11. There are things I can do to decrease air pollution.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

12. There is very little I can do to protect the environment.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

13. If I were to recycle regularly, my efforts would decrease waste in the New River Valley.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

14. If I wanted to, I could change my lifestyle in such a way that will be better for the environment.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

15. Every little bit of recycling makes a difference in protecting the environment.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

16. If other people are not going to do things to preserve the environment, there's very little that I can do to change them.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

17. Environmental problems are out of my personal control.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

18. One person's efforts at recycling can have a beneficial effect on the environment.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

19. There are things I can do as an individual to save landfill space.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

APPENDIX C-3: Life Orientation Test (LOT)

1. In uncertain times, I usually expect the best.

Strongly Disagree	Disagree	Agree	Strongly Agree		
1	2	3	4	5	6

2. If something can go wrong for me, it will.

Strongly Disagree	Disagree	Agree	Strongly Agree		
1	2	3	4	5	6

3. I always look on the bright side of things.

Strongly Disagree	Disagree	Agree	Strongly Agree		
1	2	3	4	5	6

4. I'm always optimistic about my future.

Strongly Disagree	Disagree	Agree	Strongly Agree		
1	2	3	4	5	6

5. I hardly ever expect things to go my way.

Strongly Disagree	Disagree	Agree	Strongly Agree		
1	2	3	4	5	6

6. Things never work out the way I want them to.

Strongly Disagree	Disagree	Agree	Strongly Agree		
1	2	3	4	5	6

7. I'm a believer in the idea that "every cloud has a silver lining."

Strongly Disagree	Disagree	Agree	Strongly Agree		
1	2	3	4	5	6

8. I rarely count on good things happening to me.

Strongly Disagree	Disagree	Agree	Strongly Agree		
1	2	3	4	5	6

APPENDIX C-4: Merz's Psychological Reactance Scale

1. Only those things which I do out of free will really agree with me.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

2. When something is prohibited, I react against it by thinking: "That's exactly what I am going to do."

3. Advice and recommendations easily induce me to do just the opposite.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

4. I react negatively when someone tries to tell me what I should or should not do.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

5. Strong praise makes me skeptical.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

6. I often do not feel like doing something simply because others expect me to.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

7. It pleases me to see how others submit to social norms and constraints.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

8. It makes me angry when another person is presented as a role model.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

9. It makes me angry when someone points out things which are obvious to me.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

10. I resist the attempts of others to influence me.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4
1	2	3	4
5	6		6

11. I consider advice from others to be patronizing.
Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6
12. It stimulates me to contradict others.
Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6
13. Regulations and duties trigger a sense of resistance in me.
Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6
14. The thought of being dependent on others is unpleasant to me.
Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6
15. Making free and independent decisions is more important to me than it is for most other people.
Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6
16. I react strongly when someone tries to restrict my personal freedom of choice.
Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6
17. When someone forces me to do something, I say to myself: "Now that's exactly what I don't want to do."
Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

APPENDIX C-5: Environmental Concern Scale

1. The federal government will have to introduce harsh measures to halt pollution since few people will regulate themselves.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

2. We should not worry about killing too many game animals because in the long run things will balance out.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

3. I'd be willing to make personal sacrifices for the sake of slowing down pollution even though the immediate results may not seem significant.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

4. Pollution is not personally affecting my life.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

5. The benefits of modern consumer products are more important than the pollution that results from their production and use.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

6. We must prevent any type of animal from becoming extinct, even if it means sacrificing some things for ourselves.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

7. Courses focusing on the conservation of natural resources should be taught in the public schools.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

8. Although here is continual contamination of our lakes, streams, and air, nature's purifying processes soon return them to normal.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	4	5
			6

9. Because the government has such good inspection and control agencies, it's very unlikely that pollution due to energy production will become excessive.

Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

10. The government should provide each citizen with a list of agencies and organizations to which citizens could report grievances concerning pollution.

Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

11. Predators such as hawks, crows, skunks, and coyotes which prey on farmer's grain crops and poultry should be eliminated.

Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

12. The currently active anti-pollution organizations are really more interested in disrupting society than they are in fighting pollution.

Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

13. Even if public transportation was more efficient than it is, I would prefer to drive my car to work.

Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

14. Industry is trying its best to develop effective anti-pollution technology.

Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

15. If asked, I would contribute time, money, or both to an organization like the Sierra Club that works to improve the quality of the environment.

Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

16. I would be willing to accept an increase in my family's expenses of \$100 next year to promote the wise use of natural resources.

Strongly Disagree Disagree Agree Strongly Agree
1 2 3 4 5 6

APPENDIX C-6: Miscellaneous Items

Please enter the last 4 digits of your
social security number _____

The purpose of this survey is to determine your thoughts and opinions about recycling and related topics. Your participation is voluntary. Your responses will be kept totally confidential, and will not be released to anyone.

Please circle the letter of the response that is most appropriate for you.

1. I am _____ years old.
a. 18 to 22 b. 23-30 c. 31-40 d. 41-50 e. 51-65
2. I am _____
a. female b. male
3. Curbside collection of recyclables is available to me at my home.
a. YES b. NO
4. I typically receive about _____ electronic-mail messages per week:
a. 0 b. 1-3 c. 4-7 d. 8-14 e. 15 or more
5. I typically send about _____ electronic-mail messages per week:
a. 0 b. 1-3 c. 4-7 d. 8-14 e. 15 or more
6. I typically receive about _____ phone-mail messages per week:
a. 0 b. 1-3 c. 4-7 d. 8-14 e. 15 or more

7. Please fill in the circle corresponding to the frequency at which you recycle the following materials.

	<u>Weekly</u>	<u>Bi-monthly</u>	<u>Monthly</u>	<u>Never</u>
Newspaper	a	b	c	d
Paper (other than newspaper)	a	b	c	d
Plastics	a	b	c	d
Glass	a	b	c	d
Aluminum Cans	a	b	c	d
Non-Aluminum Cans	a	b	c	d
Cardboard	a	b	c	d
Aluminum foil	a	b	c	d
Motor oil	a	b	c	d
Other	a	b	c	d

8. Please fill in the circle corresponding to the frequency at which a member of your immediate family (besides you) recycles the following materials.

	<u>Weekly</u>	<u>Bi-monthly</u>	<u>Monthly</u>	<u>Never</u>
Newspaper	a	b	c	d
Paper (other than newspaper)	a	b	c	d
Plastics	a	b	c	d
Glass	a	b	c	d
Aluminum Cans	a	b	c	d
Non-Aluminum Cans	a	b	c	d
Cardboard	a	b	c	d
Aluminum foil	a	b	c	d
Motor oil	a	b	c	d
Other	a	b	c	d

9. During the last month, I have taken recyclables to the following places:

- a) curbside
- b) Corporate Research Center
- c) Band Boosters
- d) Cycle Systems
- e) Eats Natural Food Store or Annie Kay's
- f) The containers for beverage cans near the beverage machines at work.
- g) Other

APPENDIX D

The message that follow was sent to employees at the beginning of the baseline period.

To: XXX [Name of Building] Employees.
From: Larry Needleman Center for Applied Behavior Systems
Va Tech 231-8145,
DANEEDLE @ VTVM1.
Date: XXX.
Re: Recycling Program in your building.

The Corporate Research Center and the Center for Applied Behavior Systems are developing a CRC-wide recycling project. Beginning Monday, November 5th, recycling containers will be placed in each building of the CRC to allow employees to bring recyclables to work. For many employees this will provide a convenient, fossil-fuel saving alternative to transporting the recyclables to other recycling centers in the area.

During the initial stages of the program, researchers from the Center for Applied Behavior Systems will collect data in order to better understand the patterns of recycling behavior over time. As a result, please place your recyclables in bags and write the last four digits of your social security numbers on the bags, because this will allow us to keep track of employees' patterns of behavior. This information will be kept completely confidential.

In the XXX [name of Building], the containers for recyclables will be located [description of barrel location]. We will accept clear glass (jars & bottles), beverage cans, and newspapers.

Please let me know if you have any questions, comments or suggestions regarding the program.

Thank you!

APPENDIX E: Sample of signs posted on recycling bins¹⁴.

NEWSPAPER

Please write your USERID on each bag containing your recyclables because it will help us keep track of who is recycling.

Markers and bags are provided in case you don't have any.

THANK YOU!

¹⁴ This is a sample of the signs that were on the barrels in Building I. Signs on barrels at the other buildings were identical except that instead of asking for employees' for userids, the signs asked for the last four digits of their social security numbers. Obviously, signs on barrels for clear glass and aluminum cans were identical except that "CLEAR GLASS" or "ALUMINUM CANS" was typed at the top of the sign.

APPENDIX F-1: First appeal message

Dear XXX [building name] Employees:

As you know, researchers from the Virginia Tech Center for Applied Behavior Systems began a recycling project at the XXX [building name] this summer. The CRC strongly supports this effort for several reasons. First, we believe it is crucial to save natural resources, decrease pollution, and save landfill space. Recycling does all three. Second, we believe that research in this area is important to increasing the cost-effectiveness of community recycling programs. Finally, we would like to set an example for other corporations to set up similar programs.

The CRC plans to expand the current program to the other CRC buildings and continue the program on a permanent basis.

I hope to see your support in this project!

Sincerely,

Fred Meade, Director
Corporate Research Center

APPENDIX F-2: Second appeal message

Dear XXX [building name] Employee,

As a Tech researcher in the field of environmental protection since the early 70's and as an associate editor of the journal, ENVIRONMENT AND BEHAVIOR, I am extremely concerned with the state of our environment. You've probably already heard about the rapid extinction of species, global warming, the growing hole in the ozone layer, acid rain, and the pollution of rivers, lakes and streams. You also are undoubtedly aware of some of the predicted consequences of these problems.

Nonetheless, at an emotional level, it's easy to deny the seriousness of our environmental problems. The earth has been around for billions of years, therefore it's very difficult to imagine the disappearance of life on the planet or the permanent disappearance of natural beauty. Also, in order to believe something on an emotional level, we often need to personally experience it. And at this point in time, few of us have personally experienced a serious health or financial price for environmental destruction. Unfortunately, I believe that if we don't change our behavior, we will pay the price in the near future.

What can we do? We constantly make decisions in our daily lives that impact the environment. One easy thing to do is to recycle. I am aware that recyclables (newspaper, glass, and aluminum) are collected at the loading dock of your building. Therefore, each of you has opportunities to recycle your wastes either at work or at your curbside at home. Both of these are optimal solutions for the environment since no gasoline is wasted making a extra trip to some other recycling center.

If each of us makes a little extra effort to recycle, collectively we can make a difference. I hope you'll give serious thought to making that extra effort!

Cordially,

E. Scott Geller, Associate Editor,
Environment and Behavior

APPENDIX G: "Foot-in-the-Door"/"Rejection-then-Retreat" Message.

To:
From: Larry Needleman
Subject: FREE RECYCLING STICKER!
Date:

Please pick up a free "Virginia's Too Good To Waste: RECYCLE!" sticker at XXX [i.e., the loading dock of Building I; the reception area of Buildings II-III]. All you have to do is go to the loading dock and get one! These stickers were donated by the town of Blacksburg. PLEASE, ONLY ONE STICKER PER EMPLOYEE.

APPENDIX H: Indebtedness Message

The following note was attached to a bumper sticker and placed in each employee's mail.

Dear XXX [building name] Employees:

There were extra "Virginia's Too Good to Waste: Recycle!" stickers, so I thought I'd give one to each of you. Also, please don't forget to bring you recyclables to the XXX [loading dock in Building I; front desk in Buildings II-IV].

Cordially,

Larry Needleman

APPENDIX I-1: First goals plus feedback message.

Dear XXX (building name) Employees:

Over the last month, employees from your building have collectively delivered a weekly average of XX lbs of newspaper and XX lbs of glass to the bins located in your building. In addition, the weekly weight of recyclables per employee in each of the four CRC buildings was as follows: the XXX delivered the most, followed by XXX, XXX, and XXX [names of building].

Those of you who have been participating in either this program, the Blacksburg curbside recycling program, or some other recycling program are helping the environment in a very important way. For those of you who have not been participating in a recycling program, the CRC is a convenient and energy efficient (& therefore environmentally protective) place to take recyclables. Despite the fact that many CRC employees participate in some form of recycling, many others have indicated that they do not. Thus, there is much potential to increase the participation in the CRC program.

Our past research suggests that a goal of XX lbs of newspaper and XX lbs of glass would be a challenging but attainable goal for your building. Moreover, if even half the people in your building would bring in only 3 lbs of each material per week, you would far surpass these goals. I believe that if you bring in materials even once, you're likely to find that it's actually pretty convenient.

I hope you'll support this project, your building, and the environment by bringing recyclables to work if you aren't doing so already.

Thank you very much!

Sincerely,

Larry Needleman

APPENDIX I-2: Second goals and feedback message

TO: Employees of XXX [building name]
FR: Larry Needleman, 231-8145
DA: XXX
RE: Recycling Update

Over the last two weeks, the weekly weight of recyclables that XXX [building name] employees delivered to the bins located in the building has decreased compared to previous weeks (i.e., from XX lbs per week to XX lbs per week of newspaper; from XX lbs to XX lbs of glass). Of the CRC buildings, the XXX delivered the most recyclables per employee, followed by XXX, the XXX, and XXX [names of buildings].

For the next few weeks, let's bring the goal back to the amount you were previously collecting, XX lbs of paper and XX lbs of glass.

Please let me know if you have any suggestions for increasing participation at XXX [name of building].

Thank you!

APPENDIX J-1: Message announcing first week raffle

TO: Employees of XXX, XXX, XXX [Buildings II-IV]
FR: Larry Needleman
DA: XXX
RE: RECYCLING PRIZE LOTTERY!

Next week (4/15-19) by delivering aluminum cans to the bins located behind your building, you will not only be helping the environment, **BUT ALSO YOU WILL BE AUTOMATICALLY ENTERED INTO A PRIZE LOTTERY!** For every 5 aluminum cans that you deliver to your building, your name will be entered into the lottery drawing (for example, if you deliver 50 cans, your name will be entered 10 separate times).

The following PRIZES will be awarded: a 17 pint oil change from Victory Lube; a \$15 gift certificate from Charley's Restaurant; 2 \$10 gift certificates from Books, Strings, & Things; a haircut from Big Al's: The Looking Glass; 2 pairs of tickets from Triangle Lanes; 4 Batman T-shirts from B & D Comics; and a sub & drink from Substation II. Since there are a total of about 260 employees in your buildings & there are 12 prizes, **YOUR CHANCES OF WINNING A PRIZE ARE 1 IN 22!** Plus, you can increase your personal odds by bringing in lots of aluminum cans!

PLEASE CRUSH THE CANS TO REDUCE THE VOLUME AND PLEASE WRITE YOUR NAME ON EACH BAG OF CANS SO THAT YOU CAN BE IDENTIFIED. Winners names will be listed on a poster in the lobby of your building on Wednesday April 24th.

If you have any questions or comments, please contact me at 552-0336 or DANEEDELE @ VTVM1.

Thank you!

· APPENDIX J-2: Message announcing second week raffle

TO: Employees of XXX, XXX, XXX [Buildings II, III, IV]
FR: Larry Needleman
DA: XXX
RE: WIN A FREE AIRPLANE TICKET FOR RECYCLING!

This week a FREE USAir TICKET TO ANYWHERE IN THE CONTINENTAL U.S. WILL BE AWARDED TO THE WINNER OF OUR SECOND RECYCLING LOTTERY. The ticket was donated by World Travel Service Inc.

Although several employees brought recyclables to the bins last week, very few brought aluminum cans. In fact, there were many fewer people who entered the lottery than there were prizes. (The prizes will be split up among those who entered.) IF LAST WEEK'S LOTTERY (WITH VERY FEW ENTRIES) IS ANY INDICATION OF THE NUMBER OF PEOPLE WHO WILL BRING IN CANS THIS WEEK, YOU HAVE AN EXCELLENT CHANCE OF WINNING THE AIRPLANE TICKET IF YOU BRING IN ALUMINUM CANS!

In addition, YOU CAN INCREASE YOUR ODDS OF WINNING BY BRINGING IN A LOT OF CANS. For every 5 (crushed) aluminum cans you deliver to the bins located behind your building, you will be entered once in the drawing. (For example, if you deliver 50 cans, your name will be entered 10 separate times).

PLEASE CRUSH THE CANS TO REDUCE THE VOLUME, AND PLEASE WRITE YOUR NAME ON EACH BAG OF CANS SO THAT YOU CAN BE IDENTIFIED IF YOU WIN. Winners will be listed on a poster in the lobby of your building on Wednesday, May 1st.

If you have any questions or comments, please contact me at 552-0336 or send me a profs note (DANEEDLE @ VTVM1).

Thank you!

APPENDIX K

Tables K-1, K-2, and K-3 show the individual employees' patterns of delivery of aluminum cans, newspaper, and glass during the eight intervention phases of this study. It should be noted that the large percentage of unidentified bags of recyclables (about 50% of all bags) limit the conclusions that can be made about idiographic patterns of responsiveness. Each row of each table represents the pattern of delivery for a single employee. Columns two through nine represent the eight different intervention phases. In the cells of the tables, "0"s indicate that a particular employee did not deliver any recyclables during a particular intervention, and "1"s indicate that a particular employee delivered recyclables one or more times during a particular intervention. Results indicate that no employee delivered cans, paper, or glass during more than four of the eight intervention phases. Of the 443 CRC employees, 57 delivered bags of aluminum cans with identifying information at least once, 24 delivered paper, and 18 delivered glass. Table K-1 shows that the vast majority of employees who delivered cans did so only during the raffle phases. Of the 57 employees who delivered cans sometime during the program, only 4 did not do so during a raffle phase. No other clear patterns of responsiveness emerge from these tables.

Table K-1. Individual employees' patterns of delivery of aluminum cans during the different intervention phases (Ss = subject number; AP = appeal; RR = Rejection-then-Retreat; IN = indebtedness; G + FB = goal plus feedback; RF = raffle; 0 = no deliveries; 1 = at least one delivery).

Ss	AP1	RR	IN	AP2	G+ FB1	G+ FB2	RF1	RF2	SUM	Ss	AP1	RR	IN	AP2	G+ FB1	G+ FB2	RF1	RF2	SUM								
1	0	0	0	0	0	0	0	1	1	29	0	0	0	0	0	0	0	1	1								
2	0	0	0	0	0	0	0	1	1	30	0	0	0	0	0	0	0	1	1								
3	0	0	0	0	0	0	0	1	1	31	1	1	0	0	0	0	0	1	3								
4	0	0	0	0	0	0	0	1	1	32	0	0	0	0	0	0	1	1	2								
5	0	0	0	0	0	0	0	1	1	33	0	0	0	0	0	0	0	1	1								
6	0	0	0	0	0	0	0	1	1	34	0	0	0	0	0	0	0	1	1								
7	0	0	0	0	0	0	0	1	1	35	0	0	0	0	0	0	1	1	2								
8	0	0	0	0	0	0	0	1	1	36	0	0	0	0	0	0	0	1	1								
9	0	0	0	0	0	0	1	1	2	37	0	0	0	0	0	0	0	1	1								
10	0	0	0	0	0	0	0	1	1	38	0	0	0	0	0	0	1	1	2								
11	0	0	0	0	0	0	0	1	1	39	1	0	0	0	0	0	1	0	2								
12	1	0	0	0	0	0	0	1	2	40	0	0	0	0	0	0	1	1	2								
13	0	0	0	0	0	0	1	1	2	41	0	0	0	0	0	0	0	1	1								
14	0	0	0	0	0	0	0	1	1	42	0	0	0	0	0	0	0	1	1								
15	0	0	0	0	0	0	0	1	1	43	0	0	0	0	0	0	0	1	1								
16	0	0	0	0	0	0	0	1	1	44	0	0	0	0	0	0	0	1	1								
17	0	0	0	0	0	1	0	0	1	45	0	0	0	0	0	0	0	1	1								
18	0	0	0	0	0	0	0	1	1	46	0	0	0	0	0	0	0	1	1								
19	0	0	0	0	0	0	0	1	1	47	0	0	0	0	0	0	0	1	1								
20	0	0	0	0	0	0	0	1	1	48	1	0	0	0	0	0	0	0	1								
21	0	0	0	0	0	0	1	0	1	49	0	0	0	0	0	0	0	1	1								
22	0	0	0	0	0	0	0	1	1	50	0	0	0	0	0	0	1	1	2								
23	0	0	0	0	0	0	0	1	1	51	0	0	0	0	0	0	0	1	1								
24	0	0	0	0	0	0	0	1	1	52	0	0	0	0	0	0	1	1	2								
25	0	0	0	0	0	0	0	1	1	53	0	0	0	0	0	0	0	1	1								
26	0	1	0	0	0	0	0	0	1	54	0	0	0	0	0	0	0	1	1								
27	0	0	0	0	0	0	1	0	1	55	0	0	0	0	0	0	0	1	1								
28	1	0	0	0	0	0	0	0	1	56	0	0	0	0	0	0	0	1	1								
										57	0	0	0	0	0	0	1	0	1								

										5	2	0	0	0	1	12	49	69									

Table K-2. Individual employees' patterns of delivery of newspaper during the different intervention phases (Ss = subject number; AP = appeal; RR = Rejection-then-Retreat; IN = indebtedness; G + FB = goal plus feedback; RF = raffle; 0 = no deliveries; 1 = at least one delivery).

Ss	AP1	RR	IN	AP2	G+ FB1	G+ FB2	RF1	RF2	SUM
1	0	1	0	0	0	0	0	0	1
2	0	1	0	0	0	0	0	0	1
3	1	1	0	0	0	0	0	0	2
4	0	1	0	0	0	0	0	0	1
5	0	0	0	1	0	0	0	0	1
6	0	1	0	1	0	0	0	0	2
7	0	1	0	0	0	0	0	0	1
8	1	0	0	0	0	0	0	0	1
9	0	0	0	0	0	1	0	0	1
10	1	1	0	1	0	0	1	0	4
11	0	0	0	0	0	0	0	1	1
12	0	1	0	0	0	0	1	0	2
13	1	0	0	0	1	0	0	1	3
14	0	1	0	0	0	0	0	0	1
15	1	0	0	0	0	0	0	0	1
16	0	1	1	0	0	1	0	0	3
17	0	0	1	0	0	0	0	0	1
18	1	1	1	0	1	0	0	0	4
19	0	0	0	0	0	0	1	0	1
20	1	0	0	0	0	0	0	0	1
21	1	1	0	0	0	0	0	0	2
22	0	0	0	0	1	0	1	0	2
23	0	0	0	0	0	0	0	1	1
24	0	0	0	0	0	0	1	0	1
	8	12	3	3	3	2	5	3	39

Table K-3. Individual employees' patterns of delivery of glass during the different intervention phases (Ss = subject number; AP = appeal; RR = Rejection-then-Retreat; IN = indebtedness; G + FB = goal plus feedback; RF = raffle; 0 = no deliveries; 1 = at least one delivery).

Ss	AP1	RR	IN	AP2	G+ FB1	G+ FB2	RF1	RF2	SUM
1	1	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	1	1
3	0	0	0	0	1	0	1	0	2
4	0	1	0	0	0	0	0	0	1
5	1	0	0	0	0	0	0	1	2
6	0	0	0	0	0	1	0	0	1
7	0	0	0	0	0	0	1	0	1
8	1	0	0	0	0	0	0	0	1
9	0	1	0	0	0	0	0	0	1
10	0	1	0	0	0	0	0	0	1
11	0	1	0	0	0	0	0	0	1
12	1	1	1	0	0	0	0	0	3
13	0	0	0	0	1	0	0	0	1
14	1	0	0	0	0	0	0	0	1
15	0	0	0	0	1	0	0	0	1
16	1	0	0	0	0	0	0	0	1
17	1	0	0	0	0	1	0	0	2
18	0	0	0	0	0	1	0	0	1
	7	5	1	0	3	3	2	2	23

APPENDIX L: Item-Total Correlation Coefficients for the Environmental Locus of Control Scale (* = reliable at $p < .01$).

<u>Item #¹⁹</u>	<u>Coefficient</u>
39	.4764*
41	.4152*
45	.5065*
49	.6963*
53	.6040*
57	-.0701
60	.6075*
63	.5713*
66	.6373*
69	.6091*
72	.6593*
75	.7841*
77	.6846*
81	.5081*
83	.7012*
86	.5215*
89	.6960*
92	.6493*
94	.6986*

¹⁹ See Appendix D for wording of items.

APPENDIX M. Mean scores for all employees returning questionnaires by recycling status. (ELOC = environmental locus of control; LOT = Life Orientation Test, measuring optimism; CONCERN = Environmental concern; REACT = psychological reactance; RECYRPT = self-reported number of different types of recyclables delivered by the employee on a regular basis).

	RECYCLING STATUS								
	NON-PARTICIPANTS			INFREQUENT PARTICIPANTS			FREQUENT PARTICIPANTS		
	MEAN	(SD)	N	MEAN	(SD)	N	MEAN	(SD)	N
ELOC*	64.1	(10.0)	154	64.2	(10.3)	24	67.9	(9.6)	19
LOT	25.3	(4.7)	158	25.7	(5.2)	26	27.4	(3.5)	18
CONCERN	53.5	(8.4)	148	55.0	(10.6)	25	56.6	(8.1)	18
REACT	38.5	(6.5)	146	36.2	(7.8)	25	36.9	(5.0)	17
RECYRPT	3.3	(2.3)	165	3.5	(2.3)	27	3.9	(1.8)	19

*High scores were coded as being in the internal direction.

APPENDIX N-1: Cross tabulation tables of recycling status by score for full sample of employees for each scale (RECSTAT = recycling status; NON, INFREQ, FREQ = non-participants, infrequent participants, frequent participants, respectively; Exp Val = Expected Value; Std Res = Standardized Residual; ELOC = Environmental Locus of Control; LOT = Life Orientation Test; RECYPRT = self-reported number of types of recyclables delivered to any recycling center on a regular basis; CONCERN = Environmental Concern).

Crosstabulation: ELOC
By RECSTAT

RECSTAT >	Count	NON	INFREQ	FREQ	Row Total
ELOC	Exp Val	1	2	3	
	Std Res				
LOW	81	15	4	100	
	78.2	12.2	9.6	50.8%	
	.3	.8	-1.8		
HIGH	73	9	15	97	
	75.8	11.8	9.4	49.2%	
	-.3	-.8	1.8		
Column Total	154	24	19	197	
	78.2%	12.2%	9.6%	100.0%	

Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F.< 5
-----	----	-----	-----	-----
8.24023	2	.0162	9.355	None

Number of Missing Observations = 14

Crosstabulation: OPTIMISM
 By RECSTAT

RECSTAT >	Count	NON	INFREQ	FREQ	Row Total
	Exp Val	1	2	3	
	Std Res				
OPTIMISM					
	LOW	57	9	4	70
		54.8	9.0	6.2	34.7%
		.3	-.0	-.9	
	MEDIUM	50	10	4	64
		50.1	8.2	5.7	31.7%
		-.0	.6	-.7	
	HIGH	51	7	10	68
		53.2	8.8	6.1	33.7%
		-.3	-.6	1.6	
	Column Total	158	26	18	202
		78.2%	12.9%	8.9%	100.0%
Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F.< 5	
-----	-----	-----	-----	-----	
4.78420	4	.3102	5.703	None	

Number of Missing Observations = 9

Crosstabulation: REACT
By RECSTAT

RECSTAT >	Count Exp Val Std Res	NON 1	INFREQ 2	FREQ 3	Row Total
REACT					
LOW	60 68.3 -1.0	18 11.7 1.8	10 8.0 .7	88 46.8%	
HIGH	86 77.7 .9	7 13.3 -1.7	7 9.0 -.7	100 53.2%	
Column Total	146 77.7%	25 13.3%	17 9.0%	188 100.0%	
Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F.< 5	
-----	-----	-----	-----	-----	
9.27136	2	.0097	7.957	None	

Number of Missing Observations = 23

Crosstabulation: RECYRPT
By RECSTAT

RECSTAT >	Count	NON	INFREQ	FREQ	Row Total
RECYRPT	Exp Val	1	2	3	
	Std Res				
LOW		64	11	4	79
		61.8	10.1	7.1	37.4%
		.3	.3	-1.2	
HIGH		101	16	15	132
		103.2	16.9	11.9	62.6%
		-.2	-.2	.9	
Column Total		165	27	19	211
		78.2%	12.8%	9.0%	100.0%
Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F.< 5	
-----	----	-----	-----	-----	
2.43196	2	.2964	7.114	None	

Number of Missing Observations = 0

Crosstabulation: CONCERN
By RECSTAT

RECSTAT >	Count Exp Val Std Res	NON 1	INFREQ 2	FREQ 3	Row Total
CONCERN					
LOW	80 75.9 .5		13 12.8 .0	5 9.2 -1.4	98 51.3%
HIGH	68 72.1 -.5		12 12.2 -.0	13 8.8 1.4	93 48.7%
Column Total	148 77.5%	25 13.1%	18 9.4%	191 100.0%	

Chi-Square -----	D.F. ----	Significance -----	Min E.P. -----	Cells with E.P.< 5 -----
4.44068	2	.1086	8.764	None

Number of Missing Observations = 20

APPENDIX N-2: Cross tabulation tables of recycling status by score for full sample of employees for each scale (RECSTAT = recycling status; NON, INFREQ, FREQ = non-participants, infrequent participants, frequent participants, respectively; Exp Val = Expected Value; Std Res = Standardized Residual; ELOC = Environmental Locus of Control; LOT = Life Orientation Test; RECYPRT = self-reported number of types of recyclables delivered to any recycling center on a regular basis; CONCERN = Environmental Concern).

Crosstabulation: ELOC
By RECSTAT

RECSTAT >	Count	NON	INFREQ	FREQ	Row Total
ELOC	Exp Val	1	2	3	
	Std Res				
LOW		54	12	4	70
		52.6	9.8	7.6	54.3%
		.2	.7	-1.3	
HIGH		43	6	10	59
		44.4	8.2	6.4	45.7%
		-.2	-.8	1.4	
Column Total		97	18	14	129
		75.2%	14.0%	10.9%	100.0%

Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F. < 5
-----	----	-----	-----	-----
4.91662	2	.0856	6.403	None

Number of Missing Observations = 7

Crosstabulation: LOT
 By RECSTAT

RECSTAT >	Count Exp Val Std Res	NON 1	INFREQ 2	FREQ 3	Row Total
LOT					
	LOW	40 36.5 .6	6 7.4 -.5	3 5.2 -1.0	49 36.8%
	MEDIUM	25 27.5 -.5	9 5.6 1.5	3 3.9 -.5	37 27.8%
	HIGH	34 35.0 -.2	5 7.1 -.8	8 4.9 1.4	47 35.3%
	Column Total	99 74.4%	20 15.0%	14 10.5%	133 100.0%
Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F. < 5	
-----	----	-----	-----	-----	
6.57609	4	.1601	3.895	2 OF 9 (22.2%)	

Number of Missing Observations = 3

Crosstabulation: REACT
By RECSTAT

RECSTAT >	Count Exp Val Std Res	NON 1	INFREQ 2	FREQ 3	Row Total
REACT	LOW	31 38.0 -1.1	12 7.7 1.6	8 5.3 1.2	51 40.5%
	HIGH	63 56.0 .9	7 11.3 -1.3	5 7.7 -1.0	75 59.5%
	Column Total	94 74.6%	19 15.1%	13 10.3%	126 100.0%
Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F. < 5	
-----	----	-----	-----	-----	
8.64390	2	.0133	5.262	None	

Number of Missing Observations = 10

Crosstabulation: RECYRPT
 By RECSTAT

RECSTAT >	Count	NON	INREQ	FREQ	Row	
RECYRPT	Exp Val		1	2	3	Total
	Std Res					
LOW		57	9	3	69	
		51.8	10.1	7.1	50.7%	
		.7	-.4	-1.5		
HIGH		45	11	11	67	
		50.3	9.9	6.9	49.3%	
		-.7	.4	1.6		
Column		102	20	14	136	
Total		75.0%	14.7%	10.3%	100.0%	
Chi-Square	D.F.	Significance	Min E.F.	Cells with E.F.< 5		
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6.15511	2	.0461	6.897	None		

Number of Missing Observations = 0

Crosstabulation: CONCERN
By RECSTAT

RECSTAT >	Count Exp Val Std Res	NON 1	INFREQ 2	FREQ 3	Row Total
CONCERN					
LOW		52 50.0 .3	12 10.3 .5	4 7.6 -1.3	68 54.4%
HIGH		40 42.0 -.3	7 8.7 -.6	10 6.4 1.4	57 45.6%
Column Total		92 73.6%	19 15.2%	14 11.2%	125 100.0%

Chi-Square	D.F.	Significance	Min E.P.	Cells with E.P.< 5
4.51943	2	.1044	6.384	None

Number of Missing Observations = 11

LAWRENCE D. NEEDLEMAN

Date of Birth: July 30, 1963
Marital Status: Married
Home Address: 3634 Avalon Road
Shaker Heights, OH 44120
(216) 752-8032

EDUCATION:

- Sep 1991- Case Western Reserve School of Medicine and University
Present Hospitals of Cleveland, Cleveland, OH; Clinical Psychology
Intern
- Aug 1987- Virginia Polytechnic Institute and State University,
Present Blacksburg, VA; Graduate Student, M.S., Clinical
Psychology (1989); Ph.D., Clinical Psychology (in
progress)
- Aug 1986- University of Missouri, School of Medicine; Columbia,
Dec 1986 MO; Medical Student
- Aug 1981- Washington University, St. Louis, MO; Undergraduate,
Dec 1985 B.S., Biology

CLINICAL EXPERIENCE:

Southwestern Virginia Mental Health Institute:

- Summer
1991 Summer Fellow; assessed and treated psychiatric inpatients
carrying the following diagnoses: schizophrenia, bipolar
disorder, depression, anxiety disorders, substance abuse
disorders, and personality disorders; was a member of an
interdisciplinary team consisting of a psychiatrist,
psychologist, nurse, social worker, and recreational
therapist; worked with patients on both acute admissions
and long-term wards. Supervisors: Marion Keating, Ph.D.,
Denise Mance, Psy.D., and Richard Mears, Ph.D.

CLINICAL EXPERIENCE (continued):

Virginia Polytechnic Institute and State University:

Aug 1987- Graduate Clinician, Psychological Services Center;
May 1988 conducted cognitive behavioral assessment and treatment
& of individual adults and children exhibiting a variety of
Aug 1990- problems including stress, anxiety, pain, attention
May 1991 deficits, and marital distress; and co-directed a social
skills group for children with behavioral problems.
Currently supervising a first year practicum student.
Supervisors: Caryn Carlson, Ph.D., Laura Clark, Ph.D.,
George Clum, Ph.D., Richard Eisler, Ph.D., David W.
Harrison, Ph.D., Thomas Ollendick, Ph.D., Richard Winett,
Ph.D.

V.A. Medical Center, Salem, VA:

May-Dec Practicum Student, Psychology Department; treated veterans
1989 exhibiting a variety of disorders including PTSD, pain,
depression, and personality disorders; learned to
administer biofeedback; assessed vets for a variety of
reasons, for example, to determine the treatment of
choice, whether patients were serious suicide risks,
whether vets qualified for compensation; used a variety of
assessment techniques including the Rorschach, TAT, mental
status exam, and the clinical interview.

TEACHING:

Aug 1990- Graduate Instructor, Virginia Polytechnic Institute and
May 1991 State University; taught undergraduate course in Abnormal
Psychology; Fall class had about 60 students, Spring class
had 114 students; had complete autonomy in designing
course: chose text, wrote syllabus, wrote and delivered
lectures, wrote exams.

Sept 1988- Graduate Teaching Assistant, Virginia Polytechnic
Aug 1990 Institute and State University; Undergraduate course in
Personality; Presented several lectures, graded exams and
papers. Professor: Joseph Germana, Ph.D.

RESEARCH EXPERIENCE:

Virginia Polytechnic Institute and State University:

- Jan-
June 1990 Assisted writing grant proposals to: Resources for the Future, Centers for Disease Control, National Institute of Alcohol and Alcohol Abuse; wrote major sections justifying the use of particular individual difference scales for predicting baseline target behaviors and responsiveness to particular interventions; wrote theoretical sections based on a scoring system we were developing for predicting the immediate and long-term impact of intervention packages having particular characteristics. Supervisor: E. Scott Geller, Ph.D.
- Jan 1988-
Dec 1989 Masters thesis: "Continuous Processing Task Performance in Children with Attention Deficit Disorder with and without Hyperactivity: Effects of Rate and Control of Pacing." Advisor: Caryn L. Carlson, Ph.D.
- Jun-
Dec 1988 Assisted with research on "Effects of task difficulty and reward on impulsivity in children with and without hyperactivity;" helped coordinate activities of three undergraduate research assistants and collection of data; conducted achievement and intelligence testing on children ages 6 through 12. Supervisor: Caryn L. Carlson, Ph.D.

Washington University, School of Medicine:

- Jan-
July
1987 Research Technician, Pharmacology Laboratory; conducted experiments related to blood vessel relaxation; worked on an endogenous, vasorelaxant, Endothelial-Derived Relaxation Factor. Supervisor: Yitka Olander, Ph.D.
- Jan-
July
1986 Research Technician, Pharmacology Laboratory; conducted experiments on the kidney metabolism of Atriopeptin, a diuretic and natriuretic hormone. Supervisor: B. Cole, M.D.
- June-
Aug 1985 Summer Fellow, Cardiology Laboratory; assisted with experiments on a model of Sudden Cardiac Death in dogs. Supervisors: A. Davis, M.D. and P. Corr, Ph.D.

PRESENTATIONS:

Barn, L., Johnson, S., & Needleman, L. (March, 1991). Increasing the collection of recyclables in a college dormitory: Group discussions to consensus. Paper presented at the Annual Meeting of the Southeastern Psychological Association.

Geller, E.S., Needleman, L., & Randall, K. (June, 1990). Developing a taxonomy of behavior change techniques for environmental protection. Paper presented at the first United States Conference on Municipal Solid Waste Management: Proceedings from the public education and outreach sessions.

Needleman, L., Johnson, S., & Barn, L. (May, 1991). The role of high tech communication in motivating employees to recycle. Accepted for presentation at the Annual Meeting of Applied Behavior Analysis, Nashville, Tennessee.

Needleman, L., Porter, B., & Strickland, K. (August, 1990). Individual differences as determinants of responsiveness to safe driving interventions. Paper presented at the American Psychological Association Annual Convention, Boston, Massachusetts.

Roberts, S., Needleman, L., & Ludwig, T. (May, 1990). Exploring individual differences as moderators of intervention effectiveness. Paper presented at the Annual meeting of Applied Behavior Analysis, Nashville, Tennessee.

OTHER PROFESSIONAL ACTIVITIES:

Aug & Oct 1990 Guest reviewed articles submitted to the Journal of Applied Behavior Analysis and Environment and Behavior.

Aug 1988 -Present Student member of the American Psychological Association, Association for the Avancement of Behavior Therapy, and Society of Behavioral Medicine.

