A Model to Predict Recycling Behaviors: Reusing Ajzen's Model One More Time

Kathleen L. Kiwala
Portland State University

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Title: A Model to Predict Recycling Behaviors: Reusing
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APPROVED BY THE MEMBERS OF THE THESIS COMMITTEE:

Nancy A. Perrin, Chair

Laurie A. Skokan

Barry F. Anderson

Gerald D. Guthrie

Nancy Chapman

        The prediction of self-reported recycling behaviors was
examined using variations and expansions of Ajzen's theory
of planned behavior. Three hundred and forty-eight
residents from the Multnomah, Clackamas and Washington
counties in Oregon completed a questionnaire that assessed
attitude, subjective norms, perceived behavioral control,
intentions, self-reports of recycling behavior, moral

obligation and past behavior. Recycling behaviors and
intentions were grouped into three categories of difficulty
by a factor analysis. Structural equation analysis did not
support Ajzen's model. It was found that although attitudes
was correlated with the antecedent variables, it did not
directly influence intentions or behaviors. Perceived
behavioral control had the largest direct influence on
behavior. Subjective norms had the greatest direct
influence on intentions. Past behavior, as measured, was
not significantly related to any variable in the model. The
inclusion of moral obligation added significantly to the
ability to predict recycling behavior. Moral obligation
directly influenced subjective norms, attitude, perceived
behavioral control and behavior. The results suggest that
programs that aim to increase recycling behaviors should
focus on: the community good as the motivation for
recycling, the impacts of the individual's recycling
behavior on community resources, the "how to's" of
recycling, and supplying services and information about
those services.

A MODEL TO PREDICT RECYCLING BEHAVIORS:

REUSING AJZEN'S MODEL ONE MORE TIME

by

KATHLEEN L. KIWALA

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TO THE OFFICE OF GRADUATE STUDIES:

The members of the Committee approve the thesis of Kathleen L. Kiwala presented May 7, 1993.

Nancy A. Perrin, Chair

Laurie A. Skokan

Barry F. Anderson

Gerald D. Guthrie

Nancy Chapman

APPROVED:

Cord B. Sengstake, Chair, Department of Psychology

Roy W. Koch, Vice Provost for Graduate Studies and Research

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CHAPTER I

INTRODUCTION

Concerned citizens, policy makers, and researchers are
increasingly interested in finding ways to encourage others
to modify their behaviors to save the environment. New
technologies have been developed to address some of our
environmental problems, however they often produce their own
negative side effects. To use these new technologies
efficiently, it frequently is necessary for people to learn
a new set of behaviors or change existing behaviors.
Therefore, to help the environment, researchers need to
focus attention on strategies which encourage behavior
changes.

One good example of a type of behavioral change needed
to improve the environment is recycling. Recycling
involves collecting various types of reusable materials
which could be reprocessed, manufactured, and sold.
Recycling technologies result in the preservation of our
remaining resources and decreased volumes of garbage sent to
ever-diminishing landfills. The recycling system depends
upon the cooperation of manufacturers, consumers, and
reprocessing plants. Many groups and garbage collection
companies provide containers and services to collect

recyclable items, such as glass, newspapers, plastics, and metals. To make the system effective, people must perform a certain set of behaviors such as selecting, cleaning, and storing their recyclables properly. They need to stop throwing out recyclable items, even though it is a quicker and easier option.

Currently, researchers and government policy makers are trying to study and change people's behaviors that contribute to our deteriorating environment. Established behaviors that have an adverse effect on the environment need to be replaced with new behaviors that can help save and protect the environment. Some of these behavior changes will involve substantial modifications of everyday life.

Education (Allen, 1972; Cohen, 1973; Asch & Shore, 1975), various reinforcement strategies (Deslauriers & Everett, 1977; Winett & Nietzel, 1975; Geller et al., 1982; Hayes & Cone, 1977a), prompts and cues (Geller, et al., 1982; Hayes & Cone, 1977b) and feedback (Kohlenberg et al., 1976; Schnelle et al., 1980), are methods that have been applied to attempt change in people's preferences, attitudes and pro-ecological behaviors. All have met with limited success.

Research studies have examined people's attitudes toward recycling (DeYoung, 1985-86). Environmental education programs have attempted to increase awareness and knowledge, in addition to changing attitudes (Allen, 1972;

Cohen, 1973). However, providing information, increasing knowledge and changing attitudes are often insufficient to produce a behavioral change. From past research, it appears that the link between environmental education and behavior is weak (Cone & Hayes, 1980). Perhaps a model of recycling behavior, based upon the specific behavioral acts and their antecedents, would provide a more complete outline and aid in designing interventions to promote change.

Researchers have looked for ways to change people's behaviors by examining factors that may precede and influence a behavioral act. Applying models of behavior that describe underlying factors and their relationships have been useful in designing and implementing interventions. For example, education or promotion programs could better influence behavior by aiming at changing a specific underlying factor of the behavioral response. If knowledge about a particular behavior is lacking, education can focus upon increasing the skills necessary to perform that behavior. Or, if an attitude toward a behavior is negative, perhaps information or positive experiences with the behavior could be given. There are a variety of models of the antecedents of behavior that have been substantiated with different types of behaviors.

RECYCLING AS A COMMONS DILEMMA

Recycling can be viewed as a commons dilemma (Platt, 1973), where behaviors that are good for the individual and are instigated by self-serving motives, are bad for the collective. It is advantageous for an individual to throw away all their garbage, in terms of time and energy--it is quicker and easier to do so. However, it would be disastrous if all individuals did this; natural resources would be depleted and landfills would overflow. Although the destructive behavior by one individual has little impact on the whole, if all people engage in the same individual behavior, the impact on the commons is disastrous.

Platt (1973) notes that behaviors can be analyzed in terms of their associated reinforcements (rewards and punishments). There is a positive aspect of the situation which people seek, and a negative aspect which people seek to avoid. The problem is that these reinforcements become separated from the behavior in time, or when the negative reinforcement is diluted across the members of a group (Platt, 1973). This makes actions that lead to short-term positive behavior and long-term negative consequence more likely to occur. For example, the immediate reward of throwing out all your garbage is more salient than the long-term negative consequence that occurs when everyone throws out all of their garbage. Because the punishment is short-term, and the reward is long-term, we avoid performing the

behavior. In this case, we avoid sorting, cleaning, and storing recyclables because the inconvenience masks the long-term benefits of an environment with adequate resources and sufficient places to dispose garbage.

Laboratory studies have found that adding rewards for cooperative behaviors and punishments for selfish behavior helps preserve the commons (Bell, Peterson, & Hautaluoma, 1989; Komorita, 1987; Yamagishi, 1986). Other commons dilemma studies have found that cooperation and trust are essential for positive collective outcomes in the commons dilemma (Edney, 1979; Moore et al., 1987). When players were given time to study the game and communicate, they tended to come up with their own strategies for cooperative behaviors, which were often pro-ecological.

Although these are all laboratory studies, there are some implications for how we can approach the problem of changing people's behaviors in the commons dilemmas of the real world. However, it is apparent that there is more involved in individuals' behaviors than rewards and punishments. Reinforcement theory, which can be adapted for individuals, does not easily accomodate itself to the variability of groups of individuals. This is well supported in most areas of psychological research (Edney, 1980). There are different responses from individuals to certain rewards and punishments. Also missing from behavior reinforcement explanations are the influences of moral

beliefs or ethics, perceptions about group norms and group pressure to conform, attitudes, and perceptions about one's own ability to perform a behavior. Studies have found that information (Edney & Harper, 1978), identification with others (Brewer & Kramer, 1986), and some influence by one's sense of moral obligation (Gorsuch & Ortberg, 1983) play a part in one's behaviors.

A MODEL OF BEHAVIOR

Ajzen (1985, 1987) has developed a model which attempts to explain a person's tendency to perform, or not perform, a particular behavior. His Theory of Planned Behavior (TPB), which is belief-based, finds that attitudes, subjective norms, and perceived behavioral control are the determinants of intentions which then determine specific behaviors. Beliefs and the evaluation of those beliefs are the antecedents of the three initiating factors.

According to Ajzen's theory, intentions and behavior are a function of the beliefs or salient information relevant to the behavior. Beliefs concerning the likely outcomes (consequences) of a behavior and subjective evaluations of those outcomes determine whether a favorable or unfavorable attitude toward performing the behavior is held. Subjective norms are measured by the person's beliefs about the normative expectations of salient referent individuals, and the motivation to comply with these

referents.   Beliefs about factors that can prevent or
facilitate attainment of, or attempts to attain goals
produce a perception about a certain level of behavioral
control. In Ajzen's model (see Figure 1) these three
variables of attitudes, subjective norms, and perceived
behavioral control influence a person's intentions to
perform behaviors and behavior is a function of intended
behavior (intentions) and perceived behavioral control.
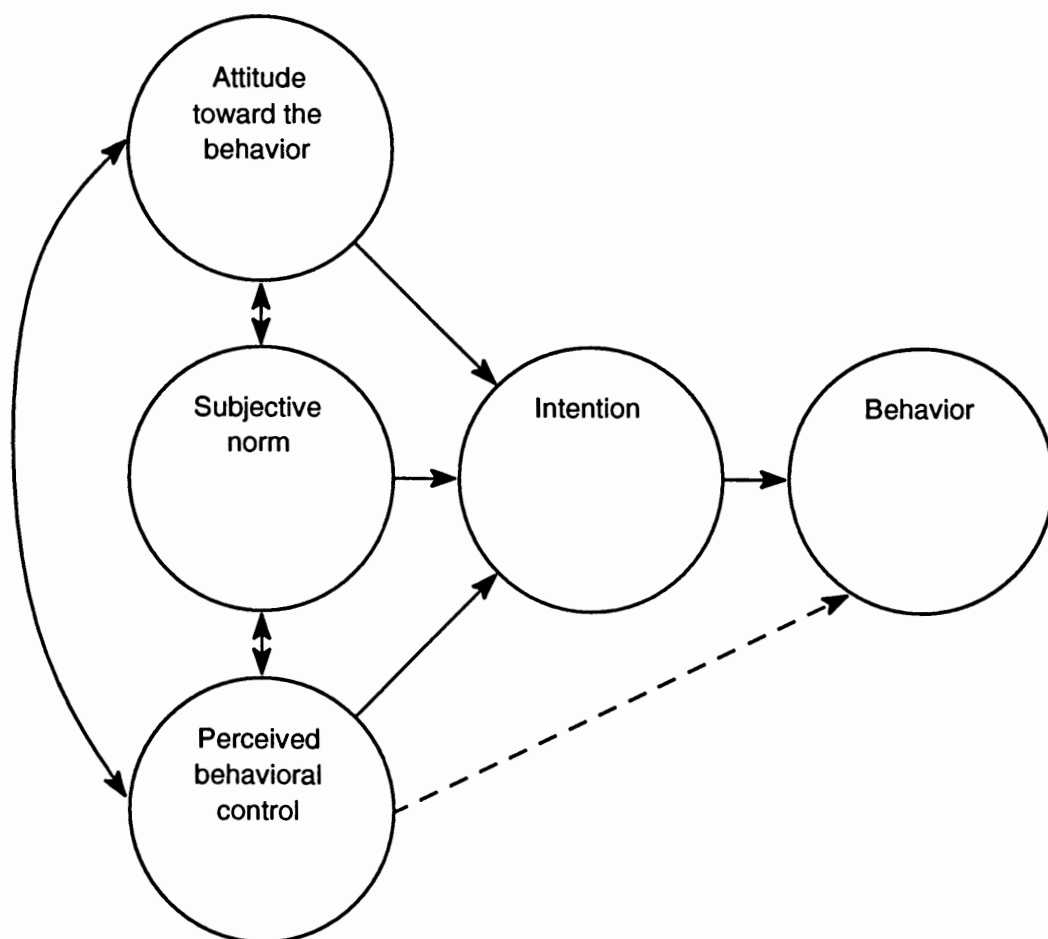
Figure 1.   Ajzen's Theory of Planned Behavior.

The components of the TPB

Attitudes. Attitudes toward a behavior have been found to correlate well with the behavior. The attitude factor in Ajzen's model is based upon two components: a behavioral belief and an evaluation of behavior outcomes. Behavioral beliefs are simply salient beliefs about that behavior. Each behavioral belief links the behavior to a certain outcome, or to some other attribute of the performance of the behavior. For example, individuals may believe that recycling all their cans, papers, and bottles (the behavior) will reduce their garbage output and their garbage bill, preserve natural resources, and take up some free time, (outcomes).

The attitude towards a behavior is determined by the individual's positive or negative evaluation of the outcomes associated with performing the particular behavior, and the strength of those associations (Ajzen, 1988, p. 120). An estimate of the attitude toward a behavior can be obtained by summing the product of each belief strength and its outcome evaluation. Another way to gain an estimate of a person's attitude is to obtain direct ratings of evaluative adjectives about a certain behavior. If a person believes that performing a certain behavior will lead to mostly negative outcomes, that person will hold an unfavorable attitude toward the behavior, the opposite holds true for favorable attitudes.

Among all the antecedents of behavior specified in the TPB (attitudes, perceived norms, perceived behavioral control) it is attitudes which usually has the greatest causal influence on behavior (Ajzen, 1971; Manstead et al., 1983; King, 1975; Ajzen & Fishbein, 1980). In general, studies have found that people are likely to perform a specific behavior if they view its probable outcomes favorably.

Subjective Norms. Another determinant of behavioral intentions is subjective norms (SN), which is a measure of a person's perception of social pressure to perform or not perform a particular behavior. People are generally more likely to perform a certain behavior when they believe that referent others, such as parents, spouse, coworkers, friends, and perhaps experts, think they should perform it.

In the TPB, attitudes and SN are often both equally important in making significant contributions to the prediction of behavioral intentions. In making a decision to join an alcoholic treatment unit (Ajzen & Fishbein, 1980), the correlations of attitude and SN with behavioral intention was found to be 0.69 and 0.67, respectively. Depending on the behavior under question, one or the other predominates. In most studies using this model, attitudes carried a higher weight in predicting intentions than did SN. In choosing between breast- vs. bottle-feeding (Manstead et al., 1983), attending church (King, 1975),

smoking marijuana (Ajzen et al., 1982), attitudes carried a higher weight than SN. However, in studies looking at women's decision to have an abortion (Smetana & Adler, 1980), and a couple's decision to have another child (Vinokur-Kaplan, 1978), SN, or the perception of social pressure, more strongly influenced the intention.

A measure of subjective norms can be attained in two ways. One method is to obtain measures of individuals' belief concerning each referent and their motivation to comply with each of the referents. Subjective norms are then the sum of each belief multiplied by each motivation to comply. Another more direct measure of subjective norms is to ask respondents to judge how likely it is that most people who are important to them would approve of their performing a given behavior.

Perceived Behavioral control. Ajzen's concept of perceived behavioral control (PBC) is closely related to Bandura's concept of self-efficacy (1977, 1982). PBC is simply the amount of control one perceives that he or she has over performing a certain behavior. If the required opportunities and resources are available, the perceived level of behavioral control should be high. If opportunities and resources necessary to perform the behavior are absent, the level of behavioral control would be perceived as being low.

There are internal factors which affect the level of PBC. Lack of information, skills, and abilities may create barriers and failures for someone attempting to perform a behavior. Often, these internal factors may be changed by training and experience.

External factors are situational or environmental factors which may be disruptive to performing a behavior (e.g., becoming too ill to perform daily cooking, cleaning, and recycling chores). In this instance, an unanticipated event brings about changes in immediate intentions, but not changes in attitude or subjective norms (Ajzen, 1987). Environmental factors may actually prevent the behavior, for example, if there is no recycling service or center available to an individual. Dependence upon the actions of others to perform a certain behavior also leads to incomplete control over behavioral goals.

These internal and external factors are actual control factors over behaviors. A person will consider all these factors when attempting to determine the ease or difficulty of performing a certain behavior. The resulting perceived level of behavioral control is also assumed to be influenced by past experience.

In TPB, perceived behavioral control is assumed to affect the motivational levels of intentions, and when the behavior is not completely volitional, PBC can possibly affect behavior directly, since it "may be considered a

partial substitute for a measure of actual control" (Ajzen, 1988, p.134). In Figure 1, the broken line between PBC and behavior indicates the potential relationship which can exist when the behavior is not completely volitional.

To obtain a direct measure of a respondent's PBC for certain behaviors, people are is usually asked to rate how easy or difficult they consider performance of specific behaviors, and if practice of the behavior will accomplish what the behavior is said to accomplish (e.g. by recycling, one could reduce the amount of garbage contributed to the community waste stream). The ratings on these items are summed to yield a measure of PBC.

When PBC is refined to look at specific behavioral responses, its correlation with actual performance of the behaviors becomes stronger. In general, people's attempt to perform a behavior is commensurate with the amount of confidence they have in their ability to actually do so. In general, as people become more capable of performing the behavior, their attempts will be more successful. A study looked at women's performance of breast self-examination, their PBC about the behavior, and a measure of their proficiency at the behavior (Alagna & Reddy, 1984). The correlation of PBC with the frequency of self-examinations (in the 6-months previous to the measurements) was 0.45; the correlation of proficiency at the behavior with the actual performance of the behavior was 0.57.

Intentions. A behavioral intention is the motivational result of the antecedent variables attitudes, SN, PBC, and past behaviors. An intention is an indicator of how hard a person is willing to try and how much effort they are willing to invest in performing that behavior. Behavioral intentions should correlate highly with behaviors actually performed, unless there is some intervening event, or too much time has passed. Intentions can give a highly accurate prediction of the actual performance or non-performance of the intended behavior in situations when the act is under volitional control. For example, high multiple correlations between intentions and behaviors (0.84) were found in studies on voting choice (Ajzen, 1991), and leisure activities (0.78; Ajzen & Driver, 1992). If people are free to perform a behavior, it is most likely that they will do what they intend to do.

Studies have found strong intention-behavior correlations. The correlations have ranged from 0.72 to 0.96 for behaviors such as smoking marijuana (Ajzen et al., 1982), voting choice (Ajzen & Fishbein, 1980) and having an abortion (Smetana & Adler, 1980). When behavioral goals are not completely under volitional control (e.g., losing weight and getting an "A" in a course), PBC is found to correlate with intentions, influencing intentions to pursue or not pursue the behavioral goals (Schifter & Ajzen, 1985; Ajzen & Madden, 1986).

Intentions are measured by asking individuals to indicate on several Likert scales their intention to perform a certain behavior and the intensity of that decision. Generally, people will have intentions to perform certain behaviors when they hold favorable evaluations (attitude) of the outcomes, when they think that referent others will approve of it, and if they think they have the resources and opportunities available to perform the behavior.

Support for the Model

The Theory of Planned Behavior has been well supported by empirical evidence, however the model performs better predicting certain types of behaviors. For example, the R^2 for the model applied to lying, shoplifting and cheating varies between 0.12 to 0.55 for behavior and between 0.33 to 0.61 for intentions (Beck & Ajzen, 1991). The R^2 for the model applied to leisure choices varied between 0.25 to 0.33 for behavior and between 0.37 to 0.52 for intentions (Ajzen & Driver, 1992). The variance accounted for in behavior for losing weight varies between 0.23 to 0.44 (Netemeyer & Burton, 1990; Schifter & Ajzen, 1985). The R^2 for attending a class and getting an "A" in the course varied between 0.26 and 0.45, depending on whether the measures were taken at the beginning or the end of the semester (Ajzen & Madden, 1986). Of all behaviors that the TPB model has been applied to, these last two behaviors have the least variance

accounted for (Ajzen, 1991). Ajzen attributes this pattern of results to a low correspondence between perceived and actual control.

Given the amounts of variance accounted for in these various behavioral domains, it appears that the model is still lacking. The inclusion of additional factors may improve prediction. In the area of behaviors to save the environment, beliefs about moral values may help to influence one's behaviors, however, other factors such as personal norms and past behaviors, should also be considered.

Extensions of the TPB

Past behavior. As first noted by Bentler and Speckart (1979, 1981), when a self-report measure of past behavior was included in Fishbein's Theory of Reasoned Action (the predecessor of the TPB), there remained little unexplained variance. Bentler and Speckhart examined the relations of attitudes, subjective norms, and intentions for three different categories of behaviors. Using structural equation models to predict religious behaviors, expression of negative affect, and "summer" behaviors, they found that previous behavior may influence future intentions and subsequent behavior directly without altering attitudes or subjective norms (see Figure 2). Broken lines between PB and PBC and behavior in Figure 2 and all subsequent figures indicate paths hypothesized by Bentler and Speckart.
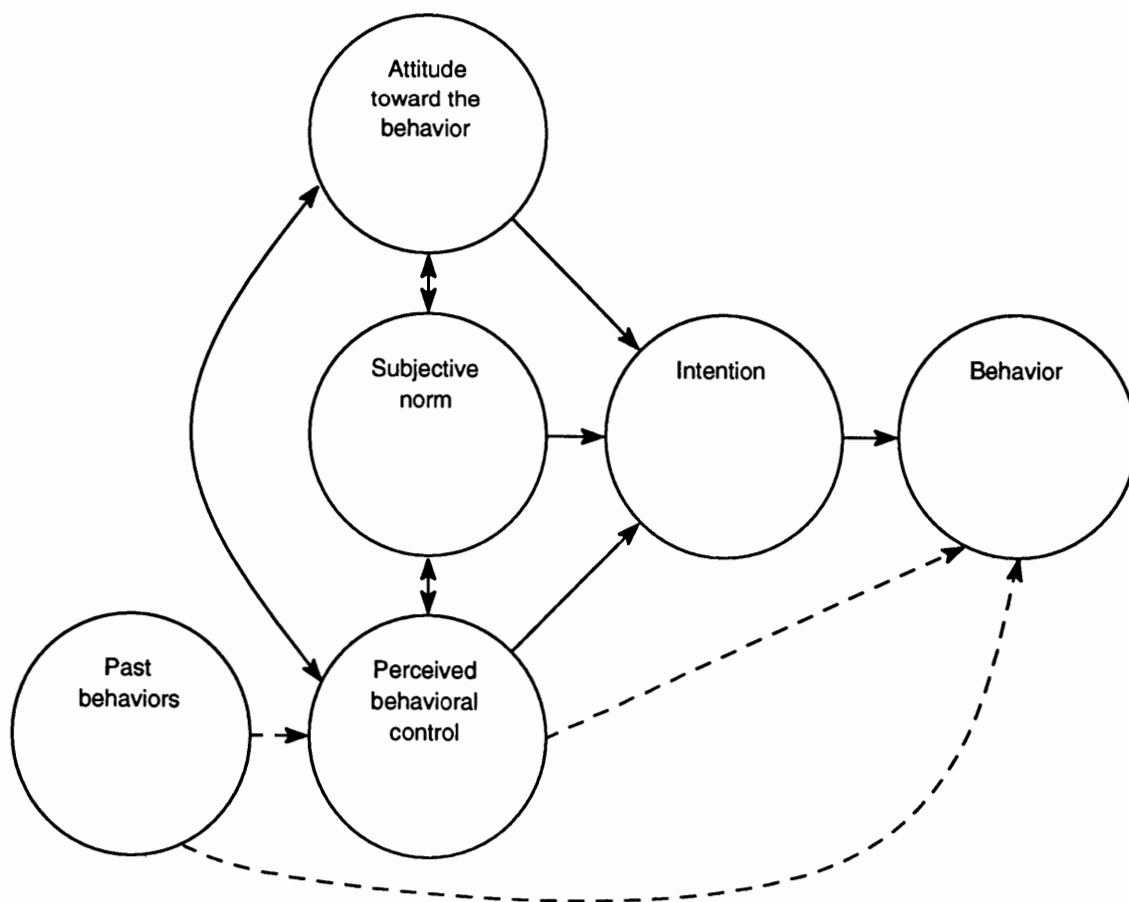
Figure 2. Possible influence of past behavior in Ajzen's Theory of Planned Behavior model.

Studies which have included Bentler and Speckart's extension of Fishbein's model have shown significant increases in the model's predictive power (Budd et al., 1984, Fredricks & Dossett, 1983, Granrose, 1984). These theorists assume that repeated past behaviors become established habits, however Ajzen (1991) disagrees. The point of contention by Ajzen is that behaviors issue forth from habits, automatically, without the mediation of attitudes, subjective norms, perceptions of control, or

intentions. Ajzen replies that past behaviors can be viewed as a reflection of the impact of factors that influence later behavior, but not as a causal factor (Ajzen, 1987). In essence, he says that attitudes, subjective norms, and perceived self-efficacy are residues of past experience. A correlation of any past and later behavior would be an indication of the behavior's stability (or reliability). Also, the variance contributed by past behavior could actually be common error variance shared by past behavior and later behavior.

It is possible that past behaviors' influence on future behavior is mediated by perceived behavioral control. Bandura's theory of self-efficacy (1986) points to how past behaviors impact self-efficacy. According to Bandura, past experience with a behavior is the most important source of information about behavioral control.

Studies relating to this mediation issue (Ajzen & Driver, 1992; Beck & Ajzen, 1991; van Ryn & Vinokur, 1990) have predicted behaviors from intentions, perceived behavioral control, and past behaviors. The inclusion of these mediating variables still resulted in a significant amount of unexplained variance in the relationship between past behavior and future behavior. Although Ajzen believes some of the direct effect from past to future behavior is due only to method variance, he also notes that in some cases it is too large to be solely attributable to that

cause (Ajzen, 1991). Consequently, the role of past behaviors is still unclear.

Values--Self-centered vs. Society-centered. Since recycling can be viewed as a commons dilemma, it can also be viewed as a moral situation. Recycling presents people with a choice between personal gain and yielding personal gain for the common good.

Gorsuch and Ortberg (1983) found moral obligation to be a significant factor in attempting to predict behavior in "moral situations." Moral obligation was found to correlate with behavioral intentions at a higher rate than either attitudes or social norms for the moral situations. This pattern was not found in the non-moral situations. In their discussion of the results, Gorsuch and Ortberg suggest that it is important to distinguish between one's personal preferences and one's sense of moral responsibility. Even though we may prefer to do one thing, we often do another-- out of a sense of moral responsibility.

Values are the determinants and guides of social behavior, ethical choices, and moral dilemmas. In his work about values, Rokeach (1973) defines a value as "an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence" (p. 5).

He hypothesizes two kinds of values: terminal values, which are concerned with desirable end-states of existence, and instrumental values, which are concerned with desirable modes of conduct. Terminal values can be self-centered or society-centered. A comfortable life and pleasure are examples of self-centered terminal values. A world of beauty and brotherhood are examples of society-centered terminal values. There are also two kinds of instrumental values, moral and competence values. Moral values are what Rokeach regards as "those that have an interpersonal focus which, when violated, arouse pangs of conscience or feelings of guilt for wrongdoing" (p. 8). Competency values have a personal focus, violation of these values leads to "feelings of shame about personal inadequacy rather than to feelings of guilt about wrong doing" (p. 8).

Both kinds of values, terminal and instrumental, are organized into separate hierarchies or value systems, where values are organized along a continuum of relative importance. According to Rokeach, various clusters of values may be associated with or guide different behaviors. In a study of value systems and environmentalists by Dunlap et al. (1983, as noted in Seligman, 1989, p. 181), it was found that relative to others, people who engaged in recycling behaviors emphasized aesthetics and self-actualization and de-emphasized safety and security. These are examples of both kinds of terminal values.

VALUES AND RECYCLING

Research on the reasons why people recycle has found that the most important reasons are intrinsic motivation and personal satisfaction (De Young, 1986; De Young & Kaplan, 1986). It was the thought of having done something worthwhile and beneficial, not the economic advantage, that the pro-environmental respondents mentioned most often. Davidson-Cummings (1977) found that recyclers described their motivation to recycle in moral and altruistic terms. Hopper and Nielsen (1991) found that people conceptualize recycling as a type of altruistic behavior. In addition, they found that experimental interventions which attempted to influence individuals' awareness of consequences and attribution of consequences increased the level of recycling.

The inclusion of personal and societal values into Ajzen's model should increase prediction accuracy. These values may affect attitude, subjective norms, and intentions (see Figure 3). Research into recycling lends support to a strong moral component of recycling behavior. One goal of the present study was to validate the contribution of moral obligation within the context of a larger model of recycling behavior.

Self - Centered Values

Society - Centered Values

Attitude toward the behavior

Subjective norm

Intention

Behavior

Past behaviors

Perceived behavioral control
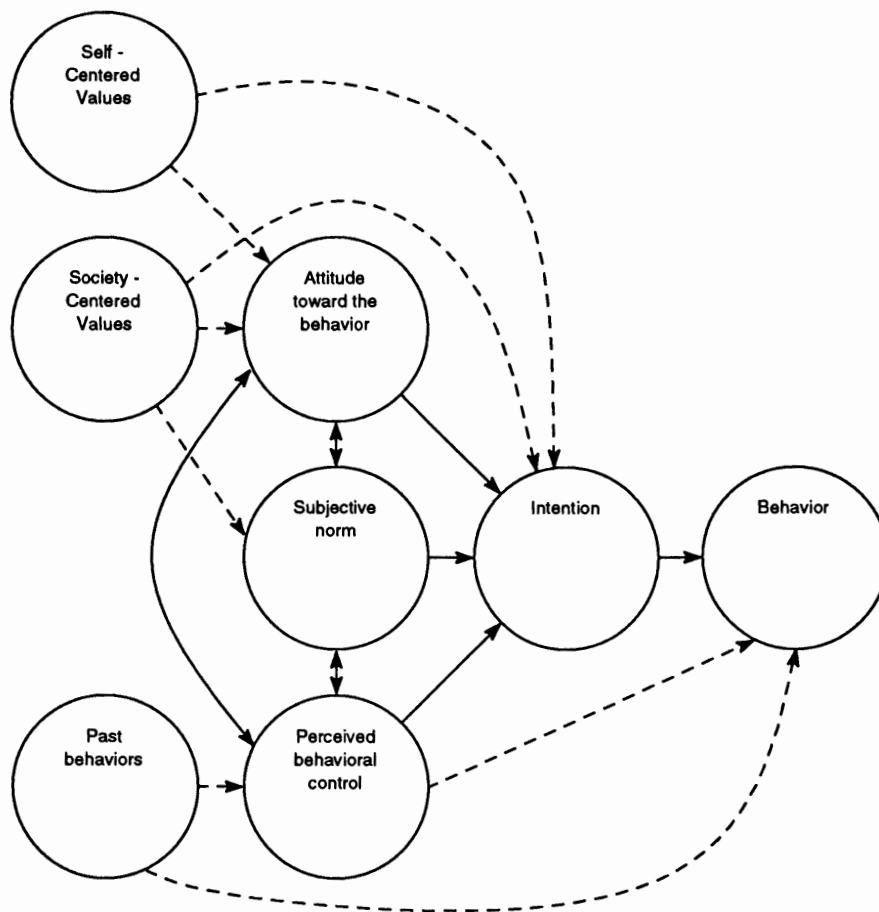
Figure 3. Possible roles of self-centered and society-centered values.

RESEARCH GOALS

This study examined several questions. First, can the TPB be used to predict recycling behaviors and intentions? Since many recycling behaviors and opportunities are new to people, and since there is a fair amount of social pressure to recycle, the factors contained in this model are appropriate to the prediction of recycling behavior.

Attitude, subjective norms and perceived behavioral control were used to predict behavioral intentions and recycling behaviors. Since intentions and behaviors were measured at the same point in time, two variations of Ajzen's model were tested. The first model (see Figure 4) tested the
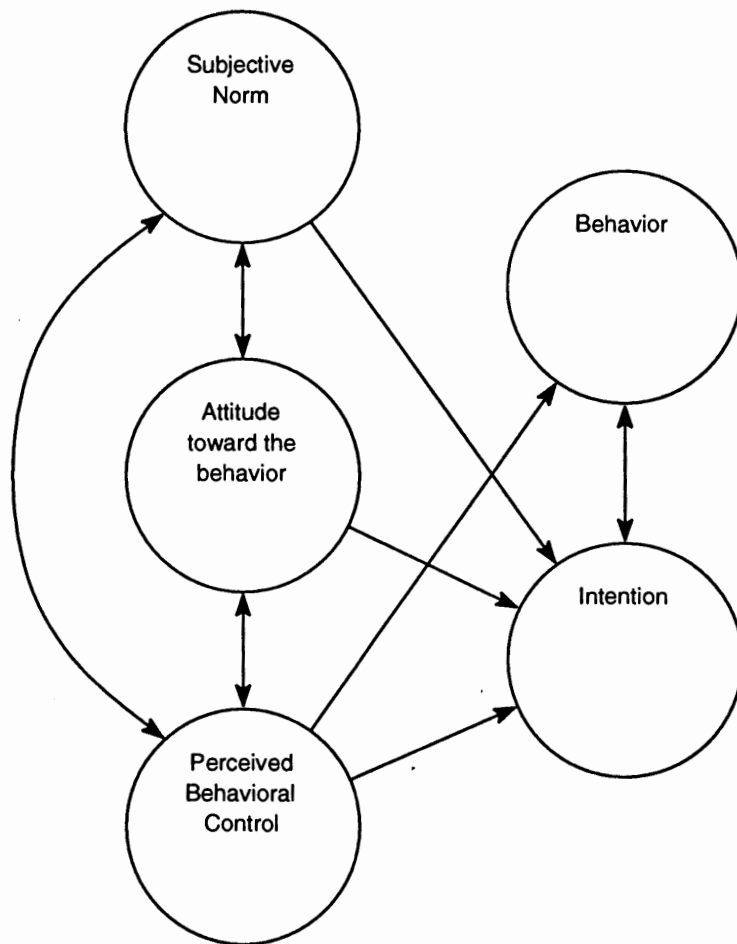
Figure 4. Ajzen's simultaneous model.

prediction of intention and behavior simultaneously from the antecedent variables. The second model (see Figure 5) examined the antecedent variables' ability to predict

current behavior which then predicts intention. It was
hypothesized that since recycling is so widely promoted as
the politically correct behavior, subjective norms would be
more predominant than attitude in determining behavior or
intention within both of these models.
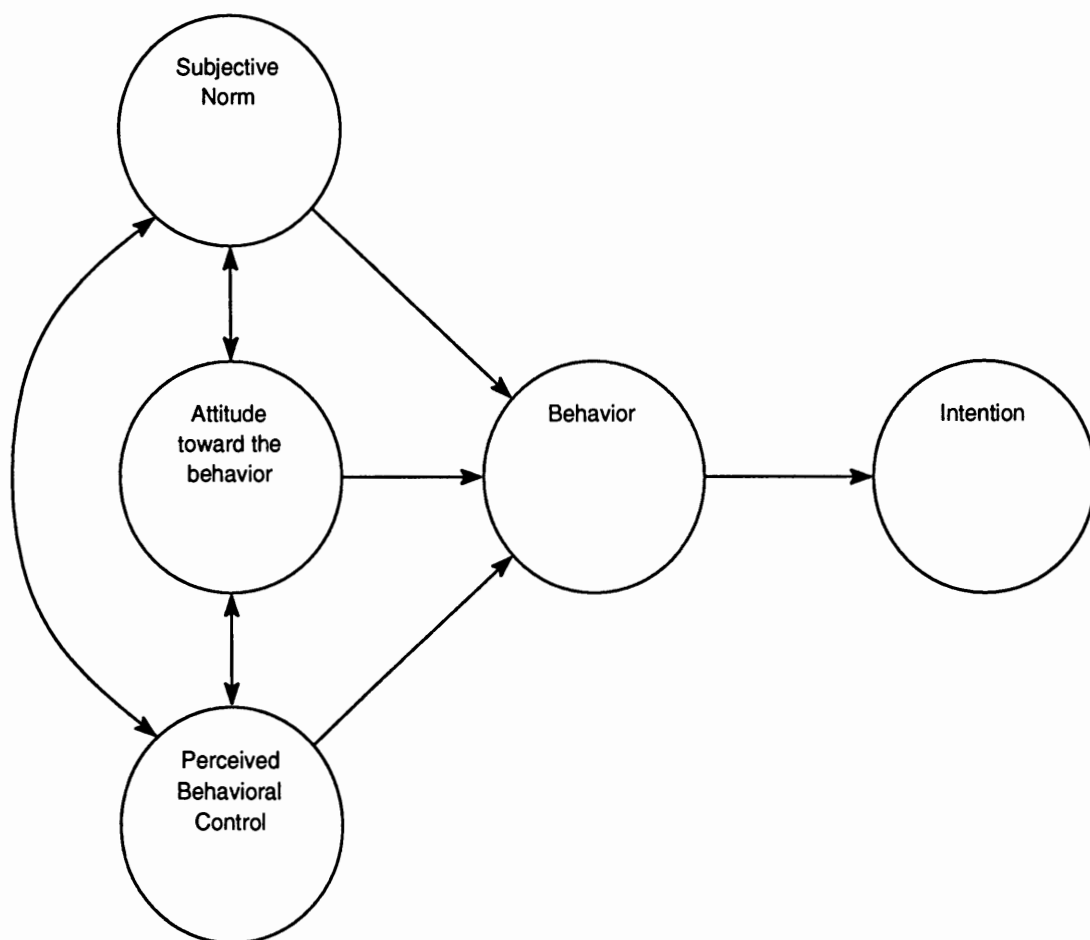
Figure 5. Variation of Ajzen's model.

Second, because recycling can be perceived as a commons
dilemma, moral obligation values were examined to determine
if self- and society-centered values are separate components

of moral obligations. That is, did people clearly express separate self-centered values and society-values or is moral obligation a unidimensional concept?

Third, will incorporating moral obligation values and past behavior into the TPB model improve prediction of behavior and intentions? The role of past behavior in behavior prediction models has been contended. Moral obligation values is a probable factor as people may consider their own short-term self-interests vs. the long-term common good when intending to perform a recycling behavior. To investigate values and past behavior in the prediction of behavior and intention, a model using values and past behavior, along with Ajzen's model variables of SN, attitude and PBC as independent variables was examined (see Figure 6).

To investigate these factors that may influence recycling behaviors, door-to-door surveys were conducted. The survey instrument was designed to measure the constructs of self-reported recycling behavior, intentions, subjective norms, attitude, perceived behavioral control, past behavior, and moral obligation values. Randomly selected households in the tri-county metropolitan area were asked to complete the questionnaire.

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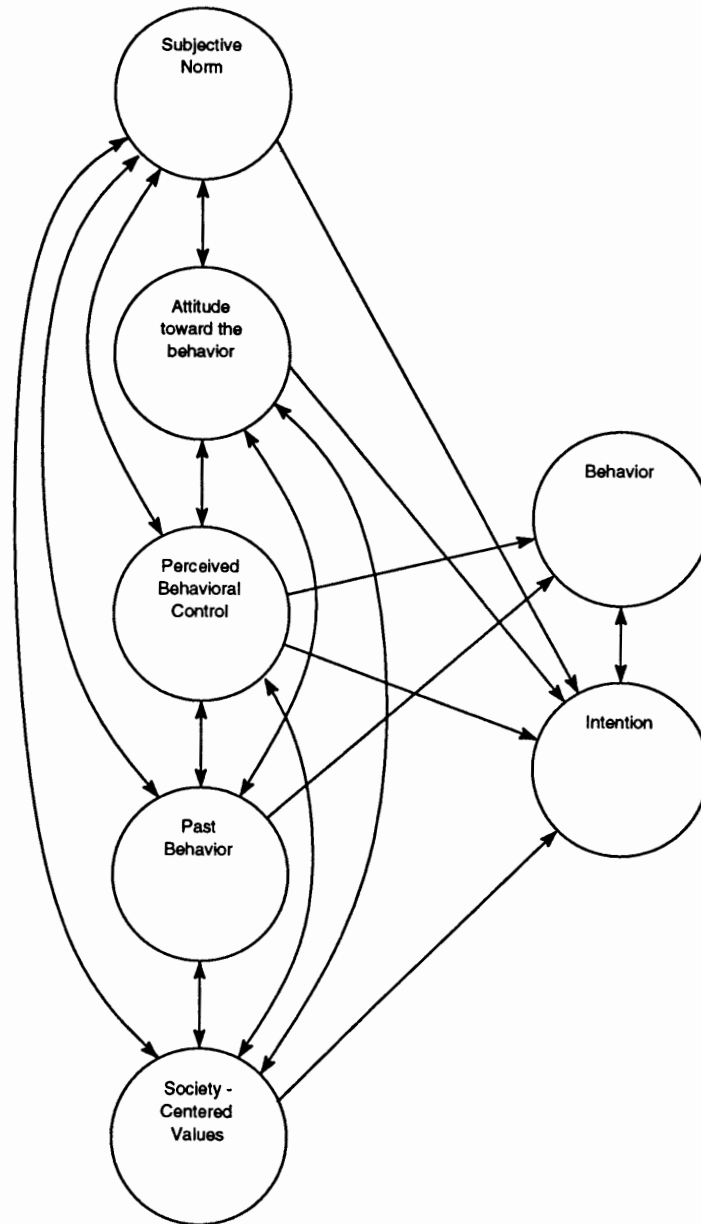
Figure 6. Simultaneous test of all variables.

CHAPTER II

METHODS

SUBJECTS AND SAMPLING

Three hundred and forty-eight residents from the tri-
county area (Clackamas, Multnomah, and Washington counties
in Oregon) filled out the recycling survey. The tri-county
area was chosen since all three counties are mandated by the
state to have similar recycling services that collect the
same types of materials.

A stratified sampling technique with probability
proportionate to size was used in this study. First, the
total tri-county region was broken into four areas,
northeast, southeast, northwest, and southwest. The 1992
Cole's Directory, compiled on 1990 U.S. Census data, was
used to determine population size and streets located in
each zip code within an area. The percentage of the sample
taken from each area was as follows: northeast, 24%,
southeast, 33%, northwest, 13%, and southwest, 30%.

The total population count for the tri-county area was
515,377. The target total sample size was 400. Therefore
the target sample sizes were 96 for the northeast, 132 for
the southeast, 52 for the northwest, and 120 for the
southwest.

A three-stage sampling procedure was used to select subjects. For each of the four areas, a zip code was randomly selected. Next, the last two digits in each consecutive number of a chart of random numbers was used to select a street from the alphabetical listing of streets within that zip code. If the street had a minimum of ten residences listed it was kept in the sample. If it had less than ten, the street was eliminated and a new zip code and street were drawn. If streets were located adjacent to each other, the most recently selected street was eliminated. This was repeated until sampling for each of the areas was complete. Houses to be surveyed were determined by locating the first street address listed within the zip code. This address was used as the starting point for surveying houses on the street. Households were approached until at least ten samples were collected in the neighborhood.

The researcher visited approximately 1,100 households[1], of which 354 agreed to participate in the survey, 234 refused, and the remaining 512 residents were not home. Of the 38 respondents who asked to mail the surveys in later, 84.2% (or 32) of the surveys were mailed back. Of the streets in the sample, only two were eliminated upon arrival, based on their location in a high crime and potentially dangerous area. All surveying was

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[1]The total residences visited and the rejection rates are approximate since counts for these figures were not kept on the first five samples.

done on the weekends to eliminate a potential bias of sampling only retired, unemployed or single income families.

MATERIALS

Community values and personal values, past behavior, attitudes, subjective norms, perceived behavioral control, intentions, and self-reported behaviors, along with some demographic information were assessed by questionnaire. (See Appendix for a copy of the survey.) Each of the eight constructs was measured or indicated by at least three questions.

Behavior measures were obtained by asking how often they have recycled newspaper, cardboard, aluminum, tin, glass, plastic, yard debris, magazines, household hazardous waste, (scrap, white,...) paper in the last month. The question "how often do you bring recyclables home from outings so that you can recycle them?" was asked as an additional measure of behavior. Each question had a 5-point answer continuum ranging from never to always. Since these were self-report measures, it would be more accurate to say that these were estimates or reports of the behavior and not actual measurements of the behavior.

Intention measures asked how likely it was that each of the items listed in the behavior measures would be recycled during the next month. Subjects were also asked how likely it is that they would bring home items from outings to be

recycled. Response alternatives ranged from extremely unlikely (1) to extremely likely (5), with another category option of "Don't have any to recycle" or "No planned outings" available to respondents.

Attitude measures utilized a semantic differential of five bipolar adjective pairs. The statement "Cleaning, sorting and preparing materials for recycling is:" was followed by the five adjective pairs: harmful/beneficial, wise/foolish, unnecessary/necessary, thrifty/wasteful, and unimportant/important. A 7-point continuum was used for respondents' answers.

The construct subjective norms were measured using ten items. For all ten items, the respondents were asked about the extent to which they agree or disagree with the statement. Responses were indicated on a 6-point scale, ranging from strongly agree to strongly disagree. The first set of questions used the statement "My ... thinks I should recycle." The second set of questions used the statement "Generally speaking, I want to do what my ... thinks I should do when it comes to recycling." These statements were asked about the respondent's immediate family, neighbors, closest friends, environmentalists, and government officials.

Perceived behavioral control measures were obtained by asking three questions with a 7 point continuum with varying anchors. The first question addressed how much control

people feel they have over whether they recycle every month. The second measure determined if they felt recycling paper, cans, and bottles every week is easy or hard. The third measure tapped their belief that they could prepare recyclables properly and get them out to be collected if desired.

Past behavior was measured by three separate questions asking respondents to compare their past and current levels of recycling. Subjects were asked to compare their present level of recycling to one month ago, six months ago, and one year ago. The response alternatives ranged from decreased greatly to increased greatly, on a 5-point scale.

The last set of items measured the moral obligation construct. The two components of moral obligation were measured using three statements with a 6-point scale ranging from strongly disagree to strongly agree. To measure society-centered values subjects were asked if they recycle because it helps preserve our limited natural resources for future generations, because recycling helps to save energy that would be needed to make brand new products, and because it helps to reduce the amount of garbage that goes into the community landfills. Self-centered values were measured by asking subjects if they recycle because they can receive money for some recyclable items, because recycling saves money on their garbage bill, and because it makes them feel good.

PROCEDURE

The researcher visited each residence on the street. After introducing herself, she briefly described the nature and goal of the study. In order to lessen the chances of bias in the respondents' answers, potential respondents were told that the goal of the study was to look at the differences between recyclers and non-recyclers. If the respondent agreed to participate, they were handed the form and asked to fill it out. The researcher volunteered to come back to pick it up in approximately a half an hour, after having talked with other people in the neighborhood. If the resident answered that it was not a good time, they were offered a self-addressed stamped envelope to return the completed survey by a specific date.

CHAPTER III

ANALYSIS

SUBJECTS

A total of 35 neighborhoods were surveyed. Of the 348
surveys collected, only 303 cases were used in the analysis.
The other 45 surveys were eliminated because less than 50%
of the questions for at least one of the eight constructs
were answered.

ANALYSIS OVERVIEW

In coding the responses for the intention construct,
all "Don't have any to recycle" and "No outings planned"
responses were recoded to extremely unlikely. This recoding
was necessary because there was not a matching category for
the behavior construct items. The rationale for the change
was that if people do not even recognize that they have
these very prevalent items, they will not recycle the
materials.

Two of the survey questions were dropped from the
analysis due to the high levels of missing responses. These
two questions were measures of subjective norms asking about
neighbors. Of the 303 surveys, 14.5%, or 44 of the
respondents failed to answer the first neighbor question and

7.6% (or 23) failed to answer the second neighbor question. All "Other" questions (from the behavior and intentions sections of the questionnaire) were not used in the analysis.

Step 1: Moral Obligation

Confirmatory factor analysis was performed on the moral obligation variables to determine if the two factors of self- and society-centered values were distinct, as hypothesized.

Step 2: Subjective Norms

Exploratory factor analysis was performed on the subjective norms variables. This was conducted to determine if the items would combine into a smaller number of logical groupings.

Step 3: Grouping for Intentions and Behaviors

The method for collapsing the indicators of intentions and behavior was based on expert knowledge and tested in this stage of the analysis. The proposed grouping placed the ten recyclable items (or materials) into categories representing the degree of difficulty a resident would encounter in trying to recycle the item. Based on the fact that all residents have certain items picked up in their curbside service, other items can be recycled at only a few depots or stores on certain dates, and some items are easier to prepare and handle than others, three categories (easy,

medium, and hard) of recycling items were created. The easy category contained the items newspaper, cardboard and glass because they are the easiest and most common materials to clean and/or handle. The medium category contained aluminum, tin and magazines because it takes more work to handle them. Some aluminum cans may be taken to a store while other aluminum usually has to be cleaned. Tin cans have to be cleaned and the ends need to be cut out. Magazines can be recycled at curbside in some areas, others have to haul them to a depot. Magazines are heavy and sometimes hard to carry. The hard category contained the items plastics, household hazardous wastes, scrap paper and yard debris. Plastics, household hazardous wastes and scrap paper are harder to recycle since they are not collected curbside and there are few places, with limited hours, that accept them. Yard debris was placed in this category, since it is not always picked up curbside. (Yard debris recycling is relatively new. Some residents have had the service for almost a year, some residents have access to weekend depots.) These categories were used to collapse both the behavior and intention variables. To substantiate the creation of these categories, an exploratory factor analysis was done using the ten variables that indicated whether or not the respondent's recycling service accepted each of the items.

Step 4: Measurement Model

Confirmatory factor analysis, was conducted on the 258 observations that were complete for all measures to simultaneously test the goodness-of-fit of the measured variables and the eight latent constructs. Variables found in the measurement model to have high error terms or non-significant t-values were eliminated. The eight constructs and their associated measured variables are illustrated in Figure 7.

Step 5: Ajzen's Models

Once the measurement model had been modified, structural equation analyses were performed on the variations of Ajzen's Theory of Planned Behavior model. The first analysis included both the intentions and behavior latent variables simultaneously in the model. (See Figure 7 for this model).

In the second analysis, the behavior and intention variables were reversed from their pattern of influence as hypothesized by Ajzen. As previously mentioned, the behavior questions in this study measured what the respondent had done in the last month's time, while the intention questions asked what the respondent planned to do in the upcoming month. Therefore, a model in which recent behavior was used to predict future intentions also was tested. (See Figure 5).
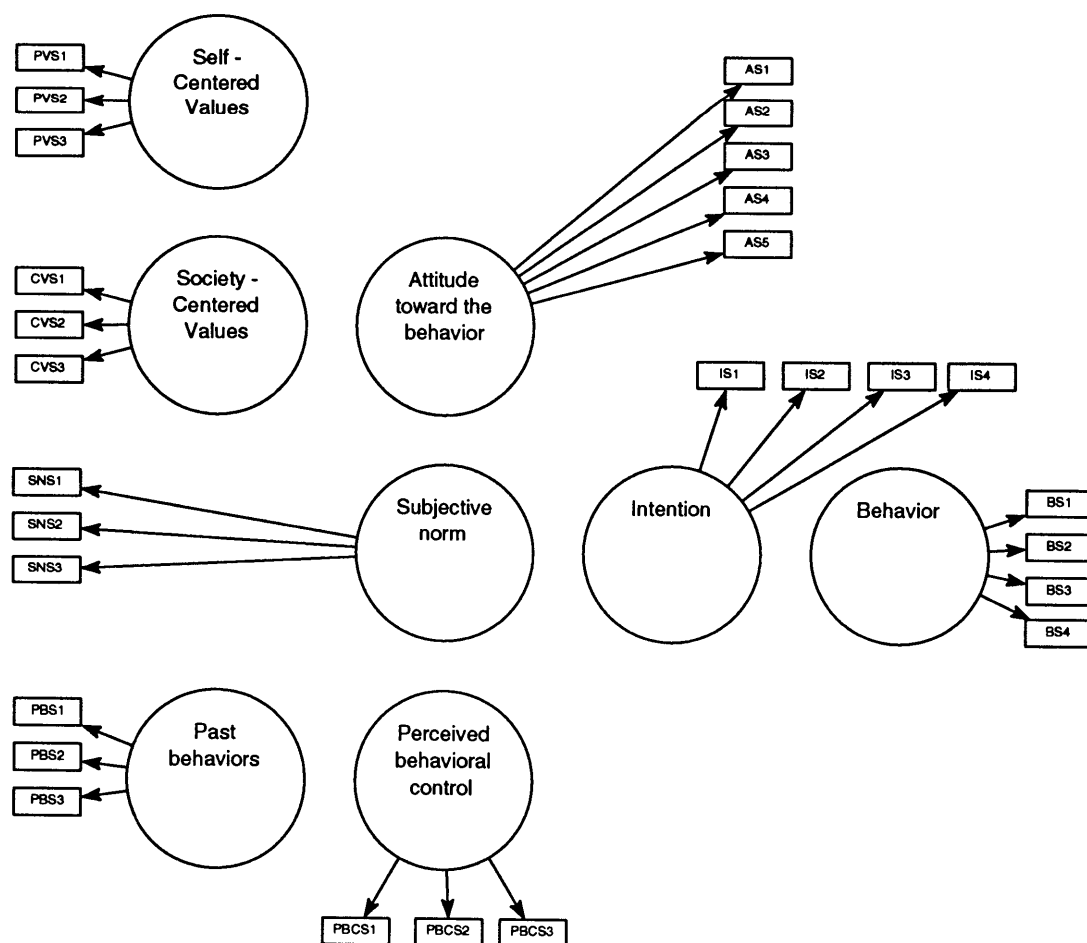
Figure 7. Latent constructs and their associated measured variables.

Step 6: Expanded Models

To determine what influence, if any, moral obligation values and past behavior had on intentions and behavior, a structural equation analysis with societal-centered values, past behavior, attitude, subjective norm, and perceived behavioral control specified as having a direct effect on the dependent variables of intention and behavior was conducted (See Figure 6).

In addition, a structural equation analysis estimated a more elaborate model theorized by the investigator. Two versions of the model, one with behavior influencing intentions and one with intentions and behaviors simultaneously in the model were estimated (see Figures 8 and 9, respectively, for these models). These models incorporated all hypothesized paths from the earlier models and included the hypothesized paths between the society-centered variable and SN, attitude and intentions.
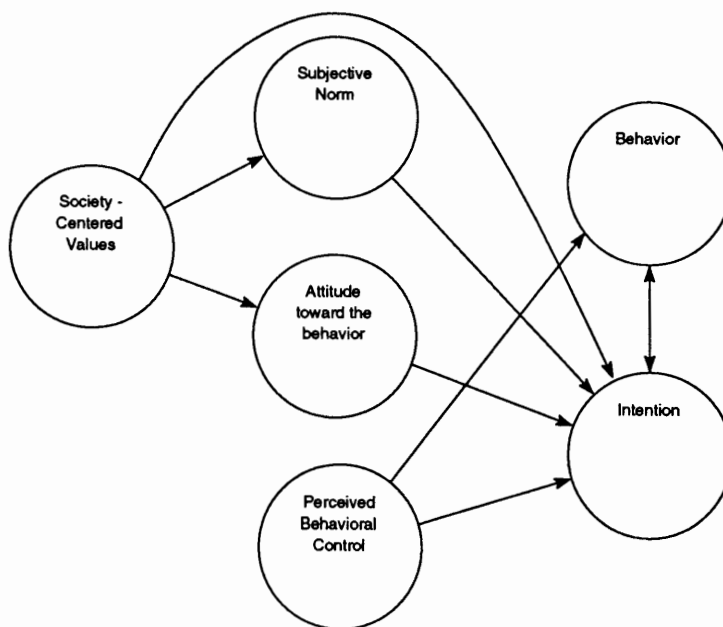
Figure 8. Expanded simultaneous model.
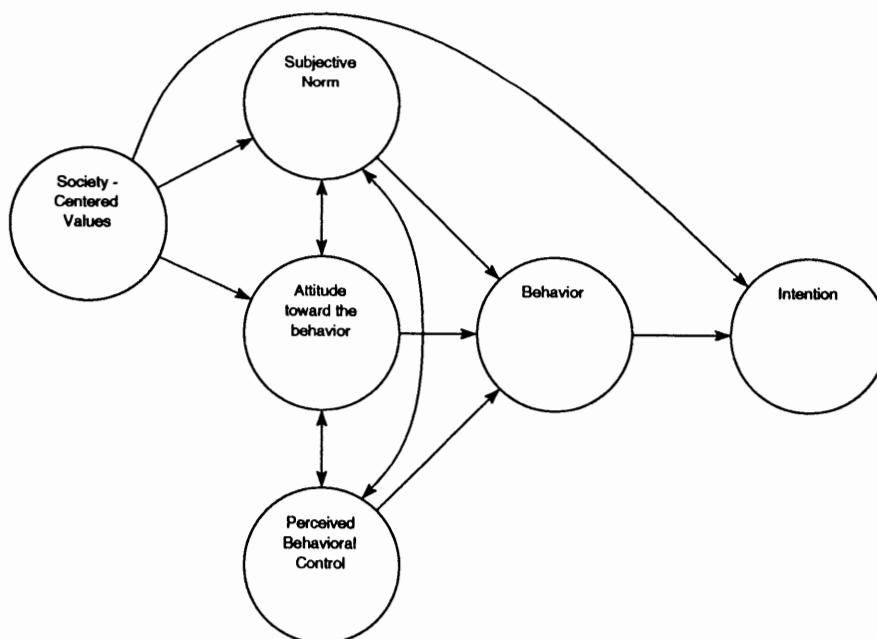
Figure 9. The expanded variation model.

ASSESSMENT OF GOODNESS-OF-FIT

To assess the overall fit of the model, four indices were examined. First was the chi-square test of the null hypothesis that the model fits the data. However, this test is extremely sensitive to sample size and often too powerful, therefore, other descriptive measures of fit were used as well (Bentler & Bonett, 1980). The Adjusted Goodness of Fit Index (AGFI) is a measure of the relative amount of variances and covariances accounted for by the model. It is less dependent on sample size than the chi-square and incorporates a penalty function for adding parameters. The Parsimonious Goodness of Fit Index (PGFI), was also calculated for each model (Mulaik et al, 1989).

This was used to compare models that differ in the number of variables. Both the AGFI and the PGFI vary between 0 and 1 with higher values indicating better fit of the model. The root mean square residual reflects the average residual between the observed data and the model generated data in terms of correlations (or covariances). Root mean square residuals would be small if the model fits well.

Two measures of detailed fit, modification indices and t-values, were examined for all models. These tested specific parameters of the model as opposed to the overall fit of the model. Modification indices indicated when a particular parameter not estimated by the model could improve the fit if that parameter was included in the model. The t-value for a parameter tested whether the sample parameter was significantly greater than zero. In other words, it tested if the path, factor loading or covariance contributes significantly to the model. All models were modified by adding or omitting paths based on theorical reasoning, t-values and modification indices.

CHAPTER IV

RESULTS

DESCRIPTIVE STATISTICS

The typical (modal) respondent's household utilized their curbside service and recycled at home. They lived in a single family home that they owned. There were two adults with no children (under the age of 18) living in the residence. Table I gives a more detailed description of the entire sample.

Almost all households (95.7%) reported having curbside recycling service available to them. This figure would be expected in the metropolitan area, since all the local governments are required to have such service available to all residents. The few respondents who claimed not to have recycling service may haul their own garbage to the dump. Sixty-five percent of the respondents noted that they also used a recycling depot. Only 21.8% took recyclable materials to a buyback center. Forty and six-tenths percent gave recyclables to non-profit groups (e.g. Boy Scouts, etc.). Only 4.6% of the sample claimed they didn't know what recycling services were available to them; one respondent claimed that no recycling services were available.

For the ten recyclable materials listed as items, 97%
of the sample said they could recycle newspaper, 77.6% said
they could recycle aluminum, 85.5% said they could recycle

TABLE I

DESCRIPTION OF SAMPLE, IN PERCENTAGES

Recycle at home	97.6% yes	2.4% no				
Own or Rent	83.7% own	16.8% rent				
Type of home	88.1% single	7.6% apt./ duplex	5.2% other			
No. of persons	8.6% one	29.4% two	22.1% three	23.4% four	9.2% five	6.2% 6-11
No. of children	48.5% zero	16.5% one	21.5% two	8.6% three	2.0% four	1.9% 5-9

tin, 93.7% said they could recycle glass, 68% said they
could recycle magazines, 68% said they could recycle
plastic, 89.1% said they could recycle cardboard, 66.3% said
they could recycle yard debris, 37.6% said they could
recycle household hazardous waste, and 39.3% responded that
they could recycle paper (white, scrap, etc).

STEPS OF THE ANALYSIS

Step 1: Factor analysis of moral obligation

The confirmatory factor analysis using LISREL suggested that the item "I recycle because I can receive money" should be dropped. The pattern of the standardized residuals, low variance accounted for and a large modification index demonstrated that the variable was not a good measure of self-centered values. The modification index for the item "I recycle because it makes me feel good" indicated that the question should load on the society-centered values factor so it was moved to that factor. The final model for moral obligation had the four items about preserving natural resources, saving energy, reducing amounts going into community landfills and making me feel good as measures for the first factor. It appears that intrinsic satisfaction is related to doing the right thing to save resources and the environment. The second factor had retained only one measure, "I recycle because it saves on the garbage bill." The chi-square for the final model, with 6 degrees of freedom, was 12.32 ($p = 0.055$), the AGFI = 0.955 and the root mean square residual was 0.135. See Table II for the standardized factor loadings.

Step 2: Factor analysis of subjective norms

The principle components analysis of the subjective norms items found three factors with eigenvalues greater than one. Oblimin rotation of the three factors extracted

with the principle axis factoring revealed a complex factor loading pattern. (See Table III for the rotated factor loadings.) The first factor reflected a measure of how much the respondent wanted to do what others want them to do.

TABLE II

THE STANDARDIZED FACTOR LOADINGS FOR CONFIRMATORY FACTOR
ANALYSIS OF THE MORAL OBLIGATION VARIABLE

Category	Factor 1	Factor 2
Future Resources	1.000	0.000
Saves Energy	0.836	0.000
Save Landfill Space	0.711	0.000
Feels Good	0.717	0.000
Reduces Garbage Bill	0.000	1.000

This factor accounted for the most variance of the three factors (42% of the total 62.1% of the variance accounted for by the three factors). The second factor reflected the impact of those persons most immediate or closest to the respondent (family and close friends). It accounted for 11% of the variance. The third factor, responsible for only 9.1% of the accounted variance, reflects a measure of beliefs about what important or knowledgeable people may think about recycling. The lower portion of Table III presents the percentage of both unique and common and unique

variance accounted for by each factor. Bold numbers
indicate the factor loadings which were considered to be
high on a particular factor.

TABLE III

ROTATED PATTERN FACTOR MATRIX FOR SUBJCECTIVE NORMS AND
PERCENTAGES OF ACCOUNTED VARIANCE

Category	Factor 1	Factor 2	Factor 3
TT Immediate Family	-0.056	**0.922**	-0.005
TT Close Friends	0.120	**0.572**	0.118
TT Environmentalists	-0.007	0.203	**0.381**
TT Government Officials	0.041	-0.098	**0.982**
WT Immediate Family	0.317	**0.423**	0.037
WT Close Friends	**0.682**	0.187	-0.049
WT Environmentalists	**0.790**	0.056	-0.049
WT Government Officials	**0.926**	-0.188	0.160
% Accounted Variance			
% of Unique	41.57	29.77	23.23
% of Common and Unique	57.41	44.86	38.42

Note: TT = ''They Think'' WT = ''Want to''

Three new factors to measure Subjective Norms were created based upon the results of the exploratory factor analysis. The first factor, 'Want to', was the mean of the scores for the variables that measured how much the respondent "wanted to do what her/his" closest friends, environmentalists, and government officials thought s/he should do when it comes to recycling. The second new factor, "Important", was the mean of the scores for three of the variables that measured how much the respondents believed that their immediate family and closest friends thought they should recycle, and how much the respondents wanted to do what their immediate family thought they should do. The third new factor, "They think", was the mean of the scores measuring what the respondents believed that environmentalists and government officials thought they should do with regard to recycling. These groupings could represent the respondents' motivation to recycle because it is promoted to be a correct behavior (factor 1), perceptions of what their closest reference groups think and the desire to do what their family wants (factor 2) and perceptions of what experts think (factor 3). It is interesting to note that perceptions of what family and friends think are distinct from what experts think. Although these factors are correlated ($r = 0.348$), perceptions of what family and friends think is not always in agreement with what experts think. A similar pattern can be seen with respect to what

people want to do. If a person's immediate family thinks they should recycle they tend to want to recycle and vice versa. However, what the experts think and wanting to do what they think loads on separate factors, which implies this relationship is not as strong. Factor 3 and factor 1 are correlated at 0.436 suggesting that people would not necessarily want to recycle just because they know that experts think they should recycle.

Step 3: Factor analysis to test the groups for behavior and intentions

Exploratory factor analysis of the variables describing which items the respondent had included in their recycling service agreed with the categories devised based on expert knowledge. Principle components analysis found two factors with eigenvalues greater than one and a third factor with an eigenvalue of 0.97. Principle axis factoring with the three factors accounted for 38.9% of the variance. See Table IV for factor loadings.

The first factor had high loadings for newspaper, glass and cardboard. The second factor had high loadings for household hazardous waste, paper, plastic, and yard debris. The third factor had high loadings for aluminum, tin, and magazines. These factors agreed with the categorization based on information that all residents would have newspaper, glass, and cardboard picked up in their curbside service, (easy behavior); aluminum, tin, and magazines

(medium behavior) may be picked up curbside and require a
bit more work to recycle. The hard behavior category had
plastics, (scrap, white,...) paper, household hazardous
waste and yard debris, which are not normally picked up at
curbside. This analysis lends support to the groupings for
the behavior and intentions variables.

TABLE IV

ROTATED PATTERN FACTOR MATRIX FOR RECYCLABLE ITEMS

Material	Factor 1	Factor 2	Factor 3
Newspaper--E	**0.588**	0.022	-0.024
Aluminum--M	0.089	0.057	**-0.548**
Tin--M	0.424	-0.089	**-0.483**
Glass--E	**0.782**	-0.058	-0.082
Magazines--M	0.030	0.345	**-0.375**
Plastic--H	-0.010	**0.490**	-0.032
Cardboard--E	**0.519**	0.210	-0.024
Yard Debris--H	0.218	**0.383**	-0.037
H. H. Haz. Waste--H	0.069	**0.582**	0.080
Paper--H	-0.151	**0.534**	-0.241

Step 4: Test of the Measurement Model

The confirmatory factor analysis using LISREL was conducted for the 28 measures of the eight constructs. All the measured variables were specified to load on only one factor, correlations among the eight constructs were estimated and the errors of the 28 measured variables were assumed to be uncorrelated. Table V gives the standardized factor loadings for the final measurement model. The results of the initial analysis indicated that two of the measured variables, both variables for the self-centered moral obligation construct, should be dropped from the model because of negative or greater than one error terms in the model. Both variables ("the reason I recycle is because I can receive money" and "the reason I recycle is because it saves me money on my garbage bill") accounted for very little, if any, variance in the model, and had non-significant t-values for the associated factor loadings. This analysis reinforced the results of the factor analysis on moral obligations in Step 1, which also dropped the variable "I recycle because I can receive money."   Dropping this and the garbage bill item required eliminating the personal values construct as this question was the only indicator of the construct. All other variables had significant t-values associated with the loadings on their construct.

The calculated measures of fit for the final measurement model (chi-square value 653.21 with df = 278 p < .000) indicated that the model could be rejected. However, the AGFI of 0.803 indicated that the data were being fairly well described by the model. The small root mean square

TABLE V

LAMBDA X MATRIX WITH THE FINAL VALUES OF THE FACTOR LOADINGS
FOR THE MEASUREMENT MODEL

	BEH	INT	SN	ATT	PBC	PB	COMMO
BHARD	.681						
BEASY	.757						
BMED	.805						
BHOME	.510						
IHARD		.691					
IEASY		.751					
IMED		.862					
IHOME		.450					
WANTO			.617				
IMPORT			.800				
THEYT			.502				
HARM/BEN				.766			
WISE/FOO				-.540			
NEC/UNNE				.930			
THRIFT/W				-.590			
UNIMP/IM				.941			
CONTROL					.461		
EASY					.754		
AGREE					.644		
1MONTH						.466	
6MONTH						.918	
1YEAR						.710	
FUTURE							.798
ENERGY							.763
LANDFILL							.679
FEELS							.644

residual for the model, RMS = 0.059, also indicated a well fitting model, as did the high PGFI (0.938).

As can be seen in Table VI, correlations among the eight latent variables showed a high correlation between the behavior and intention variables. The remaining correlations were low, supporting the discriminant validity of all other constructs.

TABLE VI

CORRELATION AMONG LATENT VARIABLES

	BEH	INT	SN	ATT	PBC	PB	CV
BEH	1.00						
INT	0.912	1.00					
SN	0.359	0.454	1.00				
ATT	0.365	0.306	0.519	1.00			
PBC	-0.524	-0.387	-0.276	-0.416	1.00		
PB	-0.028	0.081	0.091	-0.071	-0.038	1.00	
CV	0.459	0.335	0.420	0.551	-0.452	-0.014	1.00

TEST OF THE STRUCTURAL MODELS

Structural equation analysis was performed to test the two variations of Ajzen's model of Planned Behavior, a model with the five independent variables simultaneously predicting the two dependent variables (intention and behavior) and the two variations of the hypothesized model.

Table 7 shows the chi-square and the goodness-of-fit values
for all models tested. LISREL was used for all analyses.

Step 5: Ajzen's Models

The covariance structure analyses did not confirm the
Figure 4 variation of Ajzen's model in which behaviors and
intentions were specified as being correlated. Figure 10
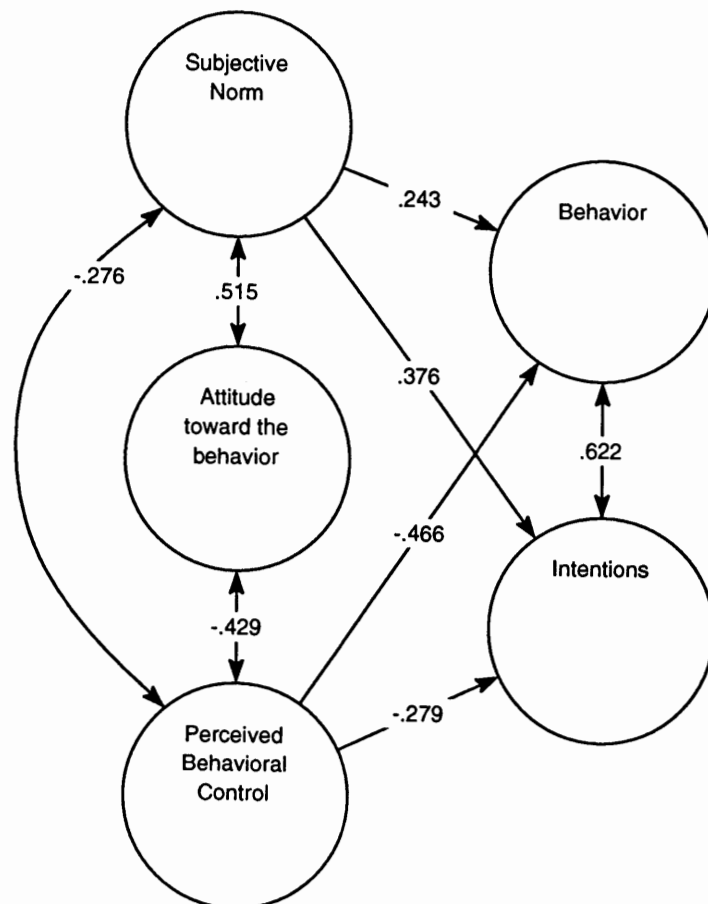presents the final model after all non-significant paths

Figure 10. Standardized path coefficients and
correlations of final Ajzen's simultaneous model.

were removed and a new path was added. The standardized

path coefficients and correlations are given for each significant path. In this model, attitude did not directly influence any of the dependent variables. However, attitude was correlated with subjective norms (0.515) and with perceived behavioral control (-0.429). These correlations were very stable across all other models tested in this study.

A path was added from subjective norms to behavior. In this model, subjective norms had a greater influence upon intentions than behavior and perceived behavioral control had the greatest influence upon behavior. This pattern of results appears to support one of the hypotheses of this study, the influence of subjective norms was more predominant than the influence of attitudes on intentions and behavior.

It should be noted that low scores on the perceived behavioral control items reflected a higher degree of perceived control. Therefore, a negative relationship with this variable would indicate that as levels of the other variables increased, so did levels of perceived behavioral control.

Next, the structural equation analysis was performed on the Figure 5 version of Ajzen's model with the behavior variable influencing intention. Once again, the results did not confirm Ajzen's theory and are very similar to the simultaneous version. Attitudes did not influence either

behaviors or intentions. Perceived behavioral control had a stronger influence (-.408) than subjective norms (.308) upon behavior. The behavior variable mediated the effects of the independent variables upon intention as no independent variable had a direct effect on intentions. Figure 11 presents the final model with the significant standardized path coefficients.
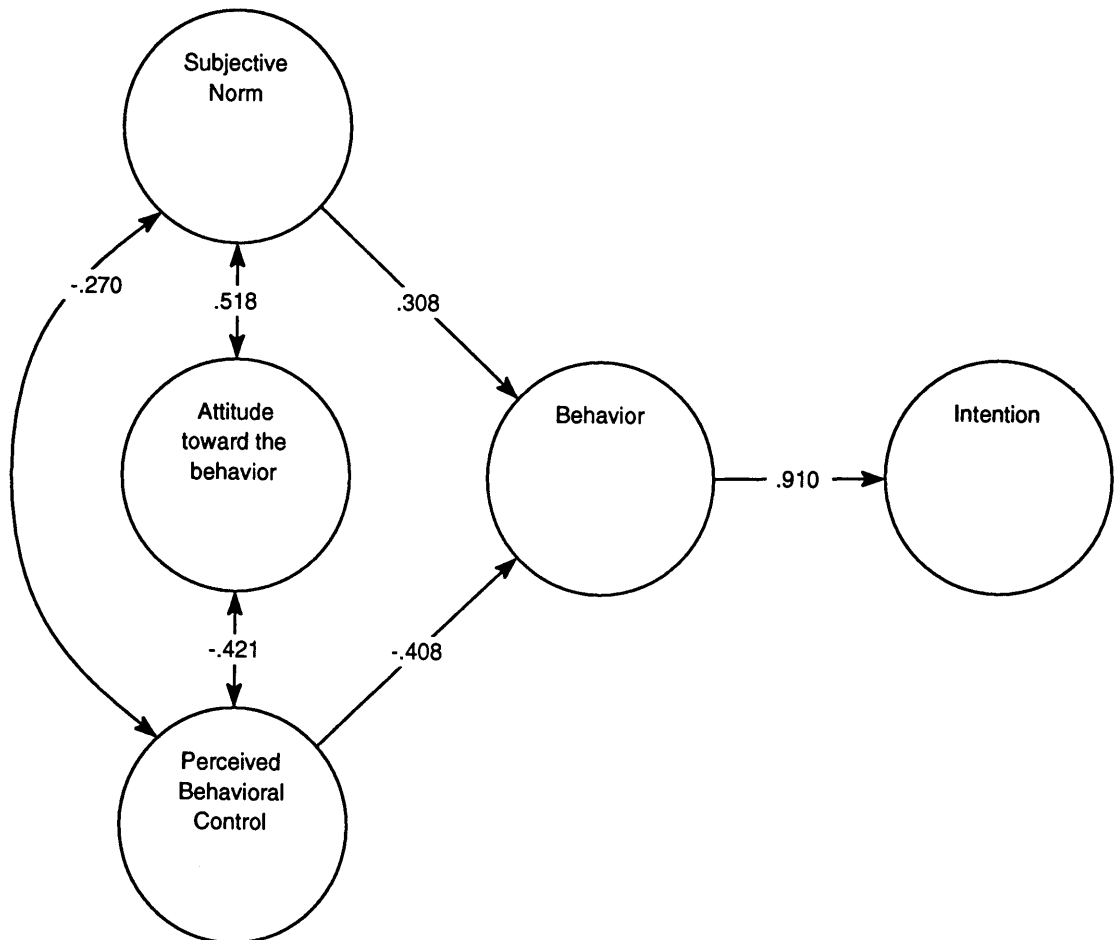

Figure 11. Standardized path coefficients and correlations of the final variation of Ajzen's model.

As can be seen in Table VII, the fit of these models were very similar. The second model fit slightly better after adjusting for differences in degrees of freedom as the PGFI was 0.642 for this model and 0.630 for the simultaneous model.

Step 6: Expanded models

The Figure 6 model with subjective norms, attitude, perceived behavioral control, past behavior, and society-centered values as the independent variables influencing intention and behavior was tested. Figure 12 presents the final model. The analysis found that subjective norms influenced only intentions, perceived behavioral control influenced intention and behavior, and society-centered values influenced only behavior. Neither attitude nor past behavior had a significant relationship with either dependent variable. This model determined that one of the new variables, society-centered values, had a significant relationship with behavior. Therefore, incorporating this variable into Ajzen's model could improve the fit of the model.
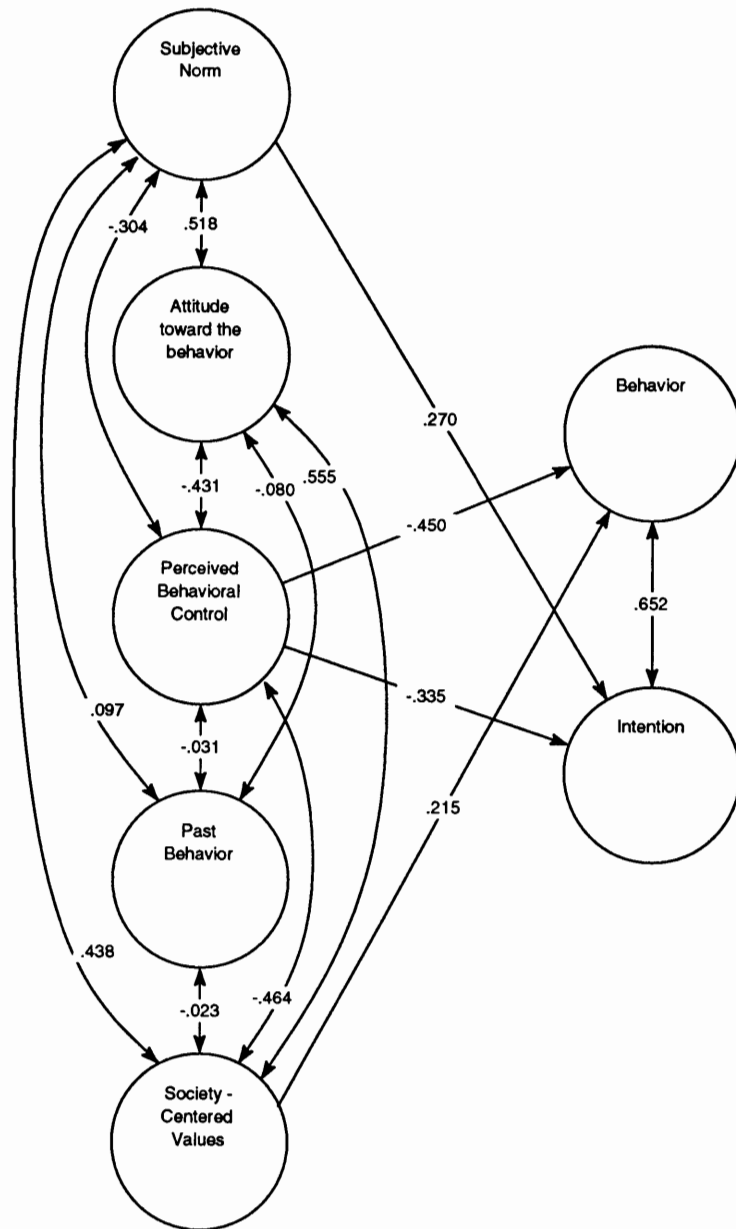
Figure 12. Standardized path coefficients and correlations of the simultaneous test.

TABLE VII

CHI-SQUARES, DEGREES OF FREEDOM, AGFI, PGFI AND RMS FOR
MODELS TESTED

Model	χ^2	df	AGFI	PGFI	RMS
Ajzen's Simultaneous					
Initial Model Fig. 4	526.79	144	.782	.633	.073
Final Model Fig. 10	519.41	144	.785	.630	.066
Variation of Ajzen					
Initial Model Fig. 5	528.73	145	.784	.637	.067
Final Model Fig. 11	528.98	146	.785	.642	.067
Simultaneous Test					
Initial Model Fig. 6	662.66	282	.803	.676	.061
Final Model Fig. 12	664.99	284	.804	.681	.062
Expanded Simultaneous					
Initial Model Fig. 8	652.19	219	.785	.658	.116
Final Model Fig. 13	596.63	218	.798	.664	.062
Expanded Variation					
Initial Model Fig. 9	612.04	219	.795	.664	.064
Final Model Fig. 14	605.05	219	.796	.665	.063

* p = .000 for all models

To further investigate the role of society-centered values and past behaviors, two additional models were tested. The first contained both intentions and behavior as correlated dependent variables in the model (Figure 8). In the second model, behavior influenced intentions (Figure 9). It was hypothesized that society-centered values affected subjective norms and attitudes and that past behaviors influenced perceived behavioral control. The results of the analysis found that in both models, past behavior did not

significantly influence any other variable in the model and
so was dropped from further analysis. In both models, the
hypothesized path from society-centered values to intentions
was not significant and so was eliminated. However instead,
a new path from society-centered values to behavior was
suggested by a large modification index and found to be
significant. The paths from society-centered values to
attitude and subjective norms were significant and the
analyses also suggested a path between society-centered
values and perceived behavioral control that had not been
hypothesized. Figures 13 and 14 show the standardized path
coefficients and correlations of the final versions of these
two models. The addition of society-centered values
improved predictions over Ajzen's models (PGFI of 0.665 vs.
0.642, respectively). See Table VII for chi-squares and
measures of fit of all models. When the standardized
solutions of the simultaneous model were examined, the
largest influence on intention was subjective norms. Of the
three variables influencing behavior, perceived behavioral
control was the greatest and subjective norms and society-
centered values were approximately the same (0.181 and
0.171, respectively). Society-centered values directly
influenced behavior, subjective norms, attitudes and
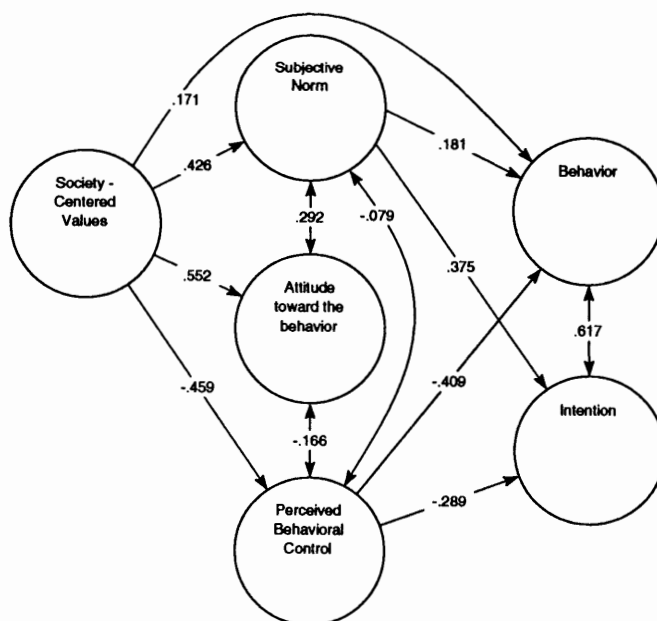
Figure 13. Standardized path coefficients and correlations of the expanded simultaneous model.
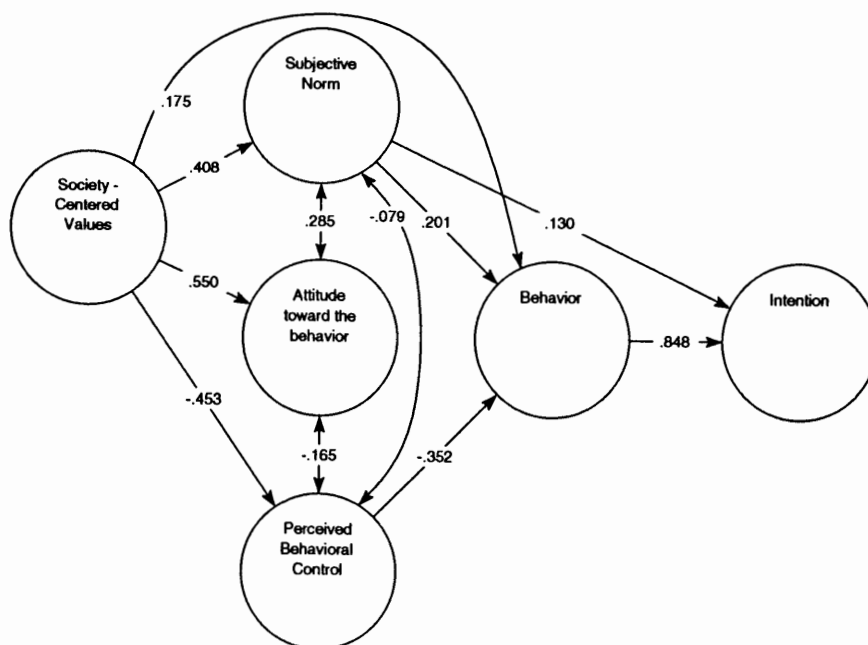
Figure 14. Standardized path coefficients and correlations of the expanded variation model.

perceived behavioral control. The influence of society-centered values was quite strong for subjective norms, attitudes and perceived behavioral control. There was a similar pattern of results for the expanded variation model (Figure 14). Society-centered values influenced the same variables as in the simultaneous model. Of the three variables influencing behavior, perceived behavioral control was the strongest, subjective norms was next and society-centered values was weakest. In this model, the latent variable intentions was directly influenced only by behavior and subjective norms. Table VIII presents the squared multiple correlations for the dependent variables of behavior and intentions for all final models.

TABLE VIII

SQUARED MULTIPLE CORRELATIONS FOR BEHAVIOR AND INTENTIONS IN
ALL MODELS

MODEL	BEHAVIOR	INTENTIONS
Ajzen's Simultaneous (Fig. 10)	0.339	0.277
Variation of Ajzen (Fig. 11)	0.329	0.829
Expanded Simultaneous (Fig. 13)	0.355	0.284
Expanded Variation (Fig. 14)	0.333	0.877

CHAPTER V

DISCUSSION

The results of the model testing led to several
important findings. Perhaps the most significant of these
were that attitudes did not directly influence behaviors and
intentions and that society-centered values affected self-
reported behavior, subjective norms, attitudes and perceived
behavioral control, either directly or indirectly.

The preliminary measurement analysis stage saw several
questions drop out of the analysis. Two of these questions
measured subjective norms about neighbors and two measured
self-centered values. It was expected that neighbors'
recycling would be a potent influence in this study. Oskamp
et al. (1991) found that the second strongest variable in
predicting participation in curbside recycling was recycling
by one's friends and neighbors. However, in the present
study, 22.5% of the neighbor questions went unanswered by
the respondents. This is a sharp contrast to Oskamp's
finding. It is interesting, that of the types of people
asked about, neighbors had the highest no-response rate.
Perhaps people do not know their neighbors well enough to
answer these questions. But in the case of recycling, even
if respondents did not know how their neighbors felt about

recycling, participation by neighbors in curbside recycling is clearly visible on collection days when brightly colored bins line the curb. Perhaps people know that their neighbors recycle but, they have not talked to them specifically about recycling. Not knowing for sure what their neighbors thought may have led the respondents to be reluctant to answer these particular questions.

THE MEASUREMENT OF MORAL OBLIGATION

The moral obligation questions were unable to measure self-centered values as a separate construct from society-centered values. The question of whether people clearly express separate self-centered values and society-centered values was not resolved. The questions as asked in this study led to a single society-centered construct. However, a better way to measure the self-centered values might have been to state these in terms of personal gain. For example, a self-centered value might be to not recycle to avoid cleaning and storing recyclables and save time. The rephrasing of the self-centered values in this cost-benefit style would also place these values within the commons dilemma framework. Framed in this light, it would be more accurate to say that self-centered values is not a moral obligation variable, since it is a collection of evaluations based on selfish motives.

The questions that measured whether people are recycling to save some aspect of the environment and that it makes them feel good loaded on the same factor. However, feeling good was hypothesized to be a self-centered value. This item's loading on the society-centered factor could mean that either the differentiation between these two types of values does not exist or that they feel good about recycling because it is something they can do to protect or preserve the environment. These results relate to past studies that have found that the most important reasons why people recycle are intrinsic motivation and personal satisfaction (De Young, 1986; De Young & Kaplan, 1986). However, in this study, motivation and satisfaction appear to be derived from society-centered values. Environmentalists most often mentioned the thought of having done something worthwhile and beneficial, not the economic advantages of recycling (De Young, 1986). This study supports those findings and suggests people in general feel similar to the environmentalists.

STRUCTURAL MODELS

In the structural phase of the analysis, there were several patterns of relationships that were common to all models. Attitudes, society-centered values and past behaviors maintain stable relationships throughout all models and in general, the results did not confirm Ajzen's

model of behavior. The hypothesis that subjective norms would have a greater magnitude in influencing behavior was not supported. Instead, perceived behavioral control had the strongest path of influence on behavior. In addition, the results supported the proposition that the inclusion of a moral obligation variable would improve the prediction of behavior and intentions.

Although the models tested led to similar results, Figure 14 is the preferred model. Of the models in which behavior affected intentions, the Figure 14 model had the largest PGFI. The squared multiple correlations of this model, as compared to the comparable Ajzen model (Figure 14 vs. Figure 11 models), were larger for both behavior and intentions. This indicates that including moral obligation increases the amount of variance in behavior and intentions explained by the model. Discussion of the role individual variables play in predicting recycling behavior will be based on the Figure 14 model.

Subjective norms

Ajzen and Driver (1992) found that the influence of subjective norms was significant for only two of five leisure behaviors and even in these two cases, subjective norms did not significantly increase the explained variance and had a minor effect on the multiple correlations. A similar pattern was found in this study, although not hypothesized. Subjective norms influenced both intentions

and behavior. The hypothesis that subjective norms would have a greater weight than other variables in influencing intentions and behavior was not supported. The path from subjective norms did not yield an appreciable impact on intentions. The low positive weight (b = 0.130) of that path would indicate that the more people perceive that others think they should recycle and the more people desire to do what others think, the greater the intention to recycle would be. However, given the small magnitude of the path, it has little influence on increasing intentions.

Perceived behavioral control

Perceived behavioral control had the strongest direct influence on behavior. These results indicate that a person will increase their recycling behavior if they perceive an increased level of control over performing a recycling behavior. Similar results were found in Alagna and Reddy's study of women's performance of breast self-exam (1984). The correlation of perceived behavioral control with the frequency of self-examinations was 0.45; the correlation of proficiency at the behavior with the actual performance of the behavior was 0.57. In general, people's attempts to perform a behavior is commensurate with the amount of confidence they have in their ability to actually do so. As they become more capable of performing the behavior, their attempts become more successful.

Attitudes

Attitudes did not directly influence either behavior or intentions, however, it was correlated with the independent variables in the model. This component of Ajzen's model has also not been supported by other studies. Several studies have not shown a link between attitude and behavior. For example, attitudes made no significant direct contributions to the prediction of leisure behaviors (Ajzen & Driver, 1992). In the present study, the effect of attitude on behavior and intentions is not direct but, it is correlated with subjective norms and perceived behavioral control which in turn is correlated with intentions and behavior.

In the present study, attitude's lack of influence may be the result of the measurement strategy. The positive and negative values which were used to evaluate attitudes towards cleaning, sorting and preparing materials for recycling were values which were often mentioned by participants in past recycling studies. This measurement strategy may have been too general to invoke attitudes towards specific acts of recycling behavior and may have diluted the magnitude of attitude's affect upon intentions and behavior.

Society-centered values

The society-centered aspect of moral obligation directly influenced behavior but not intentions. Society-centered norms affected all of the predecessor variables to behavior and intentions. In other words, as society-centered values increases, perceived behavioral control, attitude, subjective norms and self-reported recycling behavior also increases.

This study's hypothesis that moral obligation would enhance prediction of the model was shown true, however, the variable's role was different than originally hypothesized. The construct, society-centered values, was hypothesized to affect intentions. The influence of society-centered values upon behavior and perceived behavioral control was not hypothesized.

Since Ajzen's model is based on beliefs and evaluations, it seems reasonable that moral obligation influences a person's beliefs and evaluations about subjective norms, attitudes and perceived behavioral control. However, it is perplexing that moral obligations should influence behavior and not intentions. Neither behavior nor intentions is composed of beliefs and evaluations. Perhaps people are willing to do more recycling and do not see it as a sacrifice when they compare it to the impact their behavior can have on large-scale issues such as preserving future resources and community

landfill space. This pattern of findings is not unique to this study. A study by Beck and Ajzen (1991) to predict dishonest behavior included perceived moral obligation when predicting lying, cheating and shoplifting. It aided in the prediction of lying behaviors but, not in the prediction of intentions.

The influence of society-centered values upon subjective norms, attitudes and perceived behavioral control (b = 0.408, 0.550 and -0.453, respectively) were the strongest paths in the model. They indicate that increased levels of moral obligation enhanced these variables. The direct effect of moral obligation on behavior was weak (0.175), suggesting that even though increased levels of moral obligation would increase behavior, it would not have a large direct impact but instead a large indirect effect.

Past behavior

In the expanded models, past behavior did not significantly relate to any of the variables in the models. Past behavior's lack of significant influence and very low correlations with the other independent variables indicate that past recycling behavior cannot predict intentions or behavior. There are several possible explanations for this result. First, it could be that recycling is a change in people's lifestyles that is not dependent upon their past behavior. In this study, the responses showed increasing levels of recycling as compared to one month ago, six months

ago and one year ago. Compared to one month ago, 79.2% of the respondents said they recycled at the same level. Compared to six months ago, 47.2% recycled at the same level, 34.3% recycled slightly more and 14.5% had increased their recycling greatly. In comparison to one year ago, only 19.5% said their levels remained the same, 30.4% said they had increased slightly and 46.9% said they had increased greatly. Even though there is variation in the rate that people increased their level of recycling, there is no indication that these changes have a relationship with current recycling behavior or intentions. Perhaps it is not the change in past behavior but rather the past behavior itself that is important. A different measurement strategy would be needed to test this possibility.

Another possible explanation for the failure of past behavior to influence current behavior is that the survey's past behavior questions were measuring levels of past behavior differently than behavior and intentions were being measured. The measure of past behavior requested that the respondent estimate a general sense of past and current recycling behavior. Behavior and intentions asked about recycling of individual items. Past behavior of particular items might be more predictive of current recycling behavior of those items.

<u>Behavior and intentions</u>

The high correlation between behavior and intention indicates that what people are doing now is what they intend to do in the future. There appears to be no future plan to change. It is not clear how one would change intentions, given that the only other direct path, besides behavior, is a weak path from subjective norms (0.130). Recycling behavior appears to be influenced by perceived behavioral control and subjective norms. Increasing perceived behavioral control leads to better recycling. The more others think you should recycle and the more you want to follow their norms, the greater recycling behavior. As just discussed, social norms directly effects behavior only minimally and has a strong indirect effect.

APPLICATION OF THE RESULTS

In attempting changes in recycling behavior, it is important to understand the factors influencing current behaviors. This study identified factors and their relationships which provide clues as to the type of interventions that would be effective. Programs aiming to improve recycling behaviors should focus their attempts in the areas of perceived behavioral control and society-centered values.

The role of perceived behavioral control suggests that campaigns aimed at encouraging recycling behaviors would do

well to focus on how one actually does recycling. To
increase levels of internal perceived behavioral control,
informative flyers should describe how to prepare items.
For example, cans should be washed and have their labels
removed and ends cut out. Or, aluminum can be identified by
the fact that it does not stick to a magnet and should be
separated from tin cans. These "how to's" will increase the
level of perceived behavioral control, which in turn will
increase recycling according to the findings of this study.
An education strategy is consistent with the suggestions of
other studies (Sia, Hungerford & Tomera, 1985-86; Hines,
Hungerford & Tomera, 1986-87). External perceived
behavioral control can be increased by supplying the
necessary services and information about them to the
resident.

Another influential variable is society-centered
values. An ad campaign could focus on the society-centered
reasons to recycle--to preserve resources for future
generations, to maintain landfill availability, to save
energy. The campaign could translate an individual's
recycling efforts into the quantative effects on the
environment. For example, recycling a one month's supply of
daily newspapers yields a three foot stack of papers which
equals a 20' tall tree. Also, slogans, such as "Recycle for
a better tomorrow," could incorporate these society-centered
values. In turn, this would positively affect subjective

norms, attitudes and perceived behavioral control which will improve recycling behaviors.

Society-centered values and perceived behavioral control are the two variables which impacted behavior and can also be manipulated fairly easily. Focusing on what others are doing to recycle will affect subjective norms and possibly intentions but, this is not easily manipulated since reference groups vary so greatly. Campaigns focused on changing attitudes about recycling would appear to have a minor indirect impact and may not achieve the desired effects.

CRITICISMS OF THE STUDY

There are several criticisms of this study. The most obvious weakness was that the measurement of behavior and intention was being taken at the same point in time. Although the models were adjusted to accommodate this, it is hard to verify Ajzen's hypothesized patterns of influence from intentions to behavior. Future research should include a second measurement time point to determine what, if any, changes over time exist.

The self-reporting of recycling behaviors also presents a weak point in the study. Physical measurements of the behaviors, such as the number of cans and bottles and pounds of paper recycled, would strengthen the measurement of the behavior variable. This would require the cooperation of

the subjects, since materials measured would include not only items recycled at the curb but, also at depots and any other place the subject would be inclined to take the materials. Perhaps an easier measure of actual recycling behavior would be to measure the amounts of recyclable materials that the subject threw away as garbage. This would supply a truer measure of waste reduction behaviors. The relationship between behavior and its antecedent variables could be expected to decrease with the elimination of self-report bias.

An improvement to the measurement of past behavior would be to measure it in a different manner. Measurement of individual behaviors, such as what percentage of your newspaper did you recycle one year ago, might supply a better indication of past behaviors rather than asking for a general sense of how much one recycled last year compared to this year.

Several respondents commented that a subjective norms question should have focused on what they thought they should be doing instead of what others thought they should be doing. Questions that tap a personal norm construct could be compared to subjective norm measures. There it could be determined which has a greater influence on behavior.

Finally, stratifying across groups of poor, average or diligent recyclers would allow the differential patterns in

these groups to be better examined. Stronger effects may have been realized if this method had been applied.

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APPENDIX

RECYCLING QUESTIONNAIRE

Section 1.

1. Do you recycle any materials at home?   __ yes __ no

2. Using the scale below, how often have you recycled the following items in the last month?

1	2	3	4	5
Rarely/ Never	About 25% of the time	About 50% of the time	About 75% of the time	Always

Please circle only one number per item.

Newspaper	1	2	3	4	5
Cardboard	1	2	3	4	5
Aluminum	1	2	3	4	5
Tin	1	2	3	4	5
Glass	1	2	3	4	5
Plastic	1	2	3	4	5
Yard Debris	1	2	3	4	5
Magazines	1	2	3	4	5
Household hazardous waste	1	2	3	4	5
Paper (scrap, white)	1	2	3	4	5
Other (please specify _____)	1	2	3	4	5

3. Using the scale above, how often do you bring recyclables home from outings so that you can recycle them?

                1   2   3   4   5

For the next three items, please circle the numbers of the responses which best completes the statements.

1	2	3	4	5
Decreased greatly	Decreased slightly	Remained the same	Increased slightly	Increased greatly

4. Compared to 1 month ago, my present level of recycling has:

1   2   3   4   5

5. Compared to 6 months ago, my present level of recycling has:

1   2   3   4   5

6. Compared to 1 year ago, my present level of recycling has:

1   2   3   4   5

7. Have you had any change in recycling services within the last year?

_____ yes _____ no

If yes,
please check any that apply.

_____ yard debris is being collected
_____ additional item being collected
_____ item no longer being collected
_____ other (Please describe)
_____

Section 2.

1. Using the following scale, please indicate how likely it is that you will recycle each of the following items during the next month.

1	2	3	4	5	6	None
Extremely Unlikely	Unlikely	Somewhat Unlikely	Somewhat Likely	Likely	Extremely Likely	Don't have any to recycle

Newspaper	1	2	3	4	5	6	None
Cardboard	1	2	3	4	5	6	None
Glass	1	2	3	4	5	6	None
Tin	1	2	3	4	5	6	None
Aluminum	1	2	3	4	5	6	None
Yard debris	1	2	3	4	5	6	None
Plastic	1	2	3	4	5	6	None
Magazines	1	2	3	4	5	6	None
Household hazardous waste	1	2	3	4	5	6	None
Paper (scrap, white)	1	2	3	4	5	6	None
Other _____	1	2	3	4	5	6	None

2. Using the following scale, please indicate how likely it is that you will bring home recyclables from outings so that you can recycle them.

1	2	3	4	5	6	None
Extremely Unlikely	Unlikely	Somewhat Unlikely	Somewhat Likely	Likely	Extremely Likely	No planned outings

1	2	3	4	5	6	None

Section 3.

Using the following scale, please indicate the extent to which you agree or disagree with each statement.

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

1. My <u>immediate family</u> think I should recycle.
                1   2   3   4   5   6

2. My <u>neighbors</u> think I should recycle.
                1   2   3   4   5   6

3. My <u>closest friends</u> think I should recycle.
                1   2   3   4   5   6

4. The <u>environmentalists</u> think I should recycle.
                1   2   3   4   5   6

5. Most <u>government officials</u> think I should recycle.
                1   2   3   4   5   6

Using the following scale, please indicate the number which best reflects your feelings.

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

6. Generally speaking, I want to do what my <u>immediate family</u> think I should do when it comes to recycling.
                1   2   3   4   5   6

7. Generally speaking, I want to do what my <u>neighbors</u> think I should do when it comes to recycling.
                1   2   3   4   5   6

8. Generally speaking, I want to do what my <u>closest friends</u> think I should do when it comes to recycling.
                1   2   3   4   5   6

9. Generally speaking, I want to do what the <u>environmentalists</u> think I should do when it comes to recycling.
                1   2   3   4   5   6

10. Generally speaking, I want to do what most <u>government officials</u> think I should do when it comes to recycling.

           1   2   3   4   5   6

Section 4.

Now I'd like to know what you think about recycling in general. How would you rate the following statement for each pair of words? Please circle one number between 1 and 7 that is closest to your feelings.

1. Cleaning, sorting and preparing materials for recycling is:

```
Harmful                              Beneficial
1      2      3      4      5      6   7

Wise                                 Foolish
1      2      3      4      5      6   7

Unnecessary                          Necessary
1      2      3      4      5      6   7

Thrifty                              Wasteful
1      2      3      4      5      6   7

Unimportant                          Important
1      2      3      4      5      6   7
```

2. How much control do you have over whether you do or do not recycle every month?

```
Complete                             Very little
control                              control
1      2      3      4      5      6   7
```

3. For me to recycle my paper, cans, and bottles every week is:

```
Easy                                 Difficult
1      2      3      4      5      6   7
```

4. If I wanted to, I could prepare my recyclables properly and get them out to be collected.

```
Strongly                             Strongly
Agree                                Disagree
1      2      3      4      5      6   7
```

Any comments?

Section 5.

Below are some reasons why you may or may not recycle.
Using the following scale, please indicate the extent to
which you agree or disagree with each statement. Circle
only one number per statement.

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

1. I recycle because it helps preserve our limited natural
resources for future generations by re-using limited
resources.
            1   2   3   4   5   6

2. I recycle because I can receive money for some
recyclable
items (e.g. aluminum cans, paper).
            1   2   3   4   5   6

3. I recycle because my recycling helps to save energy that
would be needed to make brand new products.
            1   2   3   4   5   6

4. I recycle because recycling saves me money on my
garbage bill.
            1   2   3   4   5   6

5. I recycle because it helps to reduce the amount of
garbage that goes into the community landfills.
            1   2   3   4   5   6

6. I recycle because it makes me feel good.
            1   2   3   4   5   6

Any comments?

Section 6.

1. What type of residence do you live in?
    _____ single family
    _____ apartment/duplex
    _____ other (_____)

2. Do you rent or own your residence?
    _____ rent _____ own

3. How many people live in your residence?
    _____

4. How many children under the age of 18 live in your residence?
    _____

5. What type(s) of recycling services, if any, are available to you?
    _____ curbside collection
    _____ depot (drop off centers)
    _____ buyback centers
    _____ volunteer collections
            (e.g. Boy Scout
            newspaper bins,...)
    _____ don't know
    _____ none

6. If you do have recycling services available to you, what types of items can be recycled? (Check all that apply).
    _____ newspaper
    _____ aluminum
    _____ tin
    _____ glass
    _____ magazines
    _____ plastic
    _____ cardboard
    _____ yard debris
    _____ hazardous household waste
    _____ paper (scrap, white, etc.)
    _____ other (Please specify)
    _____

7. What street do you live on?
    _____

8. What is your zip code?
    _____