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UNDERSTANDING AND PREDICTING RECYCLING BEHAVIOR: AN APPLICATION OF THE THEORY OF REASONED ACTION*

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ABSTRACT

Longitudinal data from university students (n = 349) was analyzed to test the predictive power of a modified version of the theory of reasoned action (TRA) in the area of recycling behavior [1]. Additionally, gender differences were examined. Overall, the model was supported. Specifically, the impact of attitudes and norms on recycling behavior was mediated by intentions to recycle. Past experience with recycling was directly related to intent to recycle and to recycling behavior. The relationship between norms and intent to recycle was statistically significantly greater for females than for males. Past experience with recycling was directly related to behavior for males only. The findings suggest that gender-specific interventions may be necessary for influencing recycling behavior among adolescents and young adults.

Behavioral scientists know how difficult it is to understand, much less predict, individual behavior. In an effort to increase our understanding of behavior, numerous theoretical models have been developed. Rational decision-making models, including the theory of reasoned action (TRA) are one type of theoretical framework used for understanding behavioral choices [1, 2].

The TRA posits that the performance of a volitional behavior is affected directly by a person's intention to perform the behavior and is only indirectly affected by one's attitudes and normative beliefs regarding that behavior. Behavioral intention

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is hypothesized to be a direct function of attitudes (how one feels about the behavioral act) and subjective norms (how one perceives significant others to view the behavior). This is in opposition to other attitude-behavior theories which purport that there is a direct causal flow from attitudes to behaviors [3], as cited in [4] or those which suggest that there may be very little or no association between attitude and behavior [5].

The TRA has been effective in explaining and predicting a variety of behaviors, including seeking dental care [6], donating blood [7], and performing testicular self-examination [8]. Overall, findings from these studies generally support the hypothesized direction of influence among the major components of the model and its overall predictive power.

Studies have also been conducted to examine the TRA's effectiveness in explaining and predicting environmentally-related behaviors. Results from these studies have been mixed. For example, the components of the TRA helped to explain intentions to limit energy consumption but were not very useful in explaining energy consumption behavior [9]. The mediating power of the model was supported in a study of water conservation behavioral intentions, although the relationship between social norms and behavioral intentions was significant only for older adults and the relationship between attitudes and behavioral intentions was significant only for younger adults [10]. Other conservation behaviors used as outcomes in research that tests the TRA include repetitive energy conservation (e.g., nighttime thermostat settings) [11] and paper-recycling [12]. For the most part, the previously cited studies relied on cross-sectional data and correlational analyses to test the TRA, bringing into question whether the underlying causal assumptions of the model were adequately tested.

Several studies have shown that modifying the TRA to include additional variables may enhance the model's explanatory power (e.g., barriers to action [13]; available resources and social structure [14]; and age [10]. Other studies have indicated that having prior experience with a behavior may be directly related to behavioral intentions and behavior (e.g., energy conservation [11]; studying, exercising and dating [15]; class attendance [16]; and drinking milk [17]. Due to the habitual nature of recycling, it was believed that having had prior experience with recycling would likely affect both behavioral intentions to recycle and recycling behavior. In the present study, therefore, the original TRA was modified by including a measure of past experience with newspaper recycling.

For the present study, the population of interest comprises first-year university students, an important target group for several reasons. First, adolescents and "young" adults are beginning to assume greater responsibility for their behavioral choices, including waste reduction and recycling. Additionally, very little research has examined the current recycling-related attitudes, beliefs, and behaviors of today's adolescents and young adults.

Because the sample for the present study includes older adolescents, it was hypothesized that gender differences apparent during this developmental period

may influence the major study variables, particularly the subjective norm construct. This hypothesis is based, in part, on research that suggests that compared to adolescent males, adolescent females become increasingly sensitive to and compliant with social demands [18] and may be more susceptible to influence under certain situations [19]. To date, there have been no environmentally-related studies based on the TRA that report gender differences in attitudes, intentions, or behavior.

Van Liere and Dunlap review relevant research and conclude that the bivariate relationship between gender and environmental concern is equivocal [20]. Overall, however, women express greater affect and concern about the environment [21, 22], while males report higher levels of environmental knowledge [23], reported in Gray [24]; [22]. This evidence suggests that females may be more influenced by social factors while recycling behavior for males may stem more from an experiential base. In the present study, gender differences in the relationships between recycling attitudes, norms, intentions, past experience and behavior are examined.

The overall purpose of the current study was to investigate the causal relationships among the postulated components of a modified version of the TRA within the environmental-behavioral domain of newspaper recycling. Specifically, the hypotheses tested include: 1) the effect of subjective norms and attitudes about recycling on recycling behavior will be mediated by intentions to participate in recycling and that intentions to recycle will directly influence recycling behavior; 2) prior recycling experience will affect behavior both directly and indirectly through intentions; and 3) the magnitude of the social norms, attitudes, and intention will be greater for women and the influence of previous experience will be greater for males. Results will provide further insight into the generalizability of the TRA and its usefulness in explaining and predicting recycling behavior.

METHOD

Questionnaire Development

As recommended by Ajzen and Fishbein, exploratory data were gathered as the first step in the questionnaire development [1]. A telephone survey conducted with fifty randomly selected students from the 1988-89 freshman class of the University from which the final sample was selected, provided relevant information used to develop the population-specific recycling questionnaire. All questions were worded to focus specifically on the behavior of interest—paper and paper-product recycling in the residence hall—rather than on recycling in general. (Copies of the questionnaires may be obtained from the first author.)

Participants and Procedure

Using the self-administered questionnaire, baseline and follow-up data were gathered from first year students residing in residence halls at a large midwestern university. Baseline questionnaires were completed by 3,706 students (79% response rate). Of the 3,706 students completing the baseline questionnaire, 1,619 (35% response rate) also returned the follow-up questionnaire. Eight large residence halls at the university were randomly assigned to one of three experimental groups (and a control group) in a quasi-experiment examining the effectiveness of two recycling-education interventions (described in Goldenhar and Connell [25]. In an attempt to avoid the influence of the interventions on testing the TRA, the sub-sample used in the present analyses (n = 349) consists only of those individuals living in two residence halls assigned to the control group.

At baseline, questionnaires were administered to students attending the 1989 summer orientation program. Approximately five months after baseline, follow-up data were gathered. To avoid attenuated results, a much shorter time span between measurement periods is recommended for future research. Due to arrangements made with the University Housing Department and logistic considerations, however, a shorter time span was not possible. Using the campus mail system, students were sent a letter of explanation, a questionnaire, and a return envelope. Students were asked to place their completed questionnaires either in boxes at the residence hall or in campus mail. Students who completed and returned the questionnaire within two weeks were eligible to enter a random drawing to win one of two $50 prizes. It was believed that this strategy would increase both response rate and decrease selection bias by prompting students who were not necessarily environmental advocates to complete the questionnaire. A second mailing including another letter and questionnaire went to those students who completed the baseline questionnaire but did not return the follow-up questionnaire within two-weeks.

The Original TRA Model

The four principal constructs of the TRA include: 1) the behavior of interest, 2) behavioral intentions, 3) subjective norms regarding the behavior, and 4) attitudes towards the behavior.

TRA Constructs

All TRA constructs were measured at baseline and follow-up, with the exception of recycling behavior, which was measured only at follow-up. For each construct, an operationalization, number of representative items, scale format, response choices and alpha coefficient to assess reliability is presented.

Self-reported behavior — "How often did you place your already-read newspapers in the designated recycling areas? (1 item, 7-point Likert scale; *never*

to always). An objective measure of recycling, equal to the average monthly pounds of material picked up at each dorm (5 months worth) divided by the number of students living in the dorm (pounds of recycled newspaper/student), was obtained. This measure was not used in the present analyses because it was a gross measure of behavior (dorm level) that did not necessarily reflect behavior at the individual level. Additionally, only six data points (October through March) were available for analysis.

Behavioral intent — Perceived certainty and perceived level of involvement in the recycling program (2 items, 7-point Likert scale; *very uncertain to very certain, very uninvolved to very involved.*) Alpha coefficient = .80

Subjective norms — Perceived belief that important individuals (parents and friends) think the respondent should participate in the program (2 items, 7-point Likert scale; *strongly disagree to strongly agree*). Alpha coefficient = .73

Attitudes — Feelings about whether participating in the recycling program is *good/bad, wise/foolish, harmful/beneficial, important/unimportant, wrong/right* (5 items, 7-point semantic differential scale). Alpha coefficient = .90

In addition to the TRA constructs, past experience was measured by asking respondents to use a 7-point scale (never to always) to reflect how often they participated in newspaper recycling.

Data Analyses

Path analysis was used to test the hypothesized relationships between the models' constructs. This technique allows the assessment of the direct and indirect effects of "causal" variables on "effect" variables and determines if the data are consistent with a model implying causal relationships [26]. Results from the equations are expressed as path coefficients, which reflect the strength of the relationship between a pair of variables, taking into account all other variables that temporally precede it. Residuals, representing the amount of unexplained variance, are also calculated.

As can be seen in Figure 1, attitudes, subjective norms, and past experience are termed exogenous variables. The variance attributed to exogenous variables is not explored in path analysis because their causes are understood to lie outside the model and thus are not of central interest. The remaining constructs, the endogenous variables, are of interest because their variation is presumably explained by the variables contained within the model.

Beginning on the left side of the model, intentions were regressed on attitudes, norms, and past behavior. Next, behavior was regressed on intentions, attitudes, subjective norms, and past behavior. Although the TRA does not posit a direct relationship between attitudes, norms, and behavior, the model is tested by empirically determining the magnitude of a path that is theoretically posited to equal zero [27].

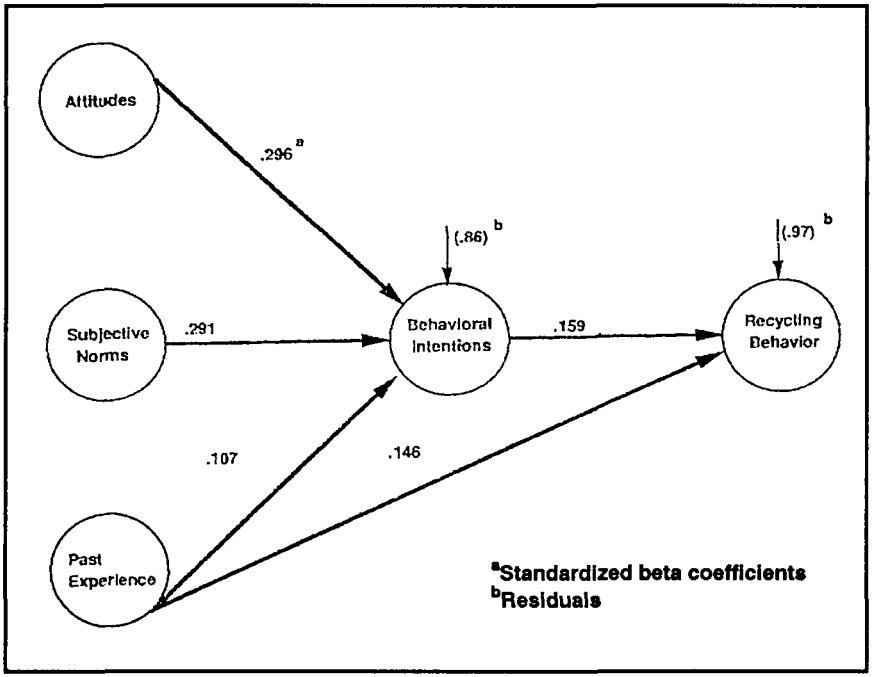

Figure 1. Path analysis of recycling behavior. Entire sample: n = 349.

RESULTS

To examine potential selection bias, analyses comparing students who completed only the baseline survey with those who completed both surveys were conducted (see results section). Students completing both surveys were more likely to be female ($t(1,3563) = 7.49$, $p \leq .001$) and liberal ($t(1,3469) = -3.54$, $p \leq .001$), and to have more positive attitudes ($t(1,3609) = -8.20$, $p \leq .001$); social norms ($t(1,3655) = -2.45$, $p < .014$) and intentions $t(1,3676) = -7.13$, $p \leq .001$) regarding recycling than students who completed only the baseline survey.

Table 1 contains descriptive statistics of each scale/variable for the complete sample and for females and males separately. The mean age of the sample was 17.7 (SD = .514) and the majority of the sample (64.3%) reported a home residence in Michigan. Overall, results suggest a general pro-environmental bias, although only a limited amount of previous experience with recycling was reported. Except for attitudes ($t(1,355) = -2.72$, $p \leq .007$), there were no significant overall differences between males and females. Females reported more pro-environmental attitudes than males.

Table 1. Means, Standard Deviations of the TRA Constructs for the Entire Sample and for Females and Males Separately

	Entire Sample (N = 349)		Females (N = 149)		Males (N = 200)	
Construct	*M*	*SD*	*M*	*SD*	*M*	*SD*
Behavior	5.4	1.8	5.3	1.8	5.4	1.8
Intentions	4.1	1.3	4.2	1.3	4.0	1.2
Attitudes	5.9	0.9	6.1	0.9	5.8	0.9
Subjective norms	4.1	1.1	4.2	1.2	4.0	1.1
Past experience	3.3	2.4	3.2	2.4	3.3	2.4

Note: Higher scores indicated a more pro-environmental position than lower scores. Scores range from 1.0 to 7.0 for each construct.

Figure 1 depicts the path coefficients (located on the arrows connecting pairs of variables) resulting from testing the first and second hypotheses. Additionally, residual path coefficients associated with each endogenous variable are located on arrows pointing only to endogenous variables. These coefficients represent the amount of unexplained variance in the endogenous variable under consideration and are calculated by subtracting the adjusted R^2 from 1 and taking the square root of that figure [27]. Several paths were statistically significant although small in magnitude. Therefore, a cutoff of .10 was used to designate prominent paths (values below .10 indicate that less that 1% of the variance was being explained). Because the first two hypotheses assessed the relative importance of the model constructs within the sample rather than across subsamples, standardized coefficients (betas) are presented [26].

Regarding the first hypothesis, findings indicate that intention to participate in recycling was directly related to reported behavior (beta = .159; $p \leq .009$) (see Figure 1). Additionally, as predicted by the TRA, the effect of attitudes and norms on behavior was mediated by intentions to behave. Specifically, the path from attitudes to intention and from norms to intention were both significant (beta = .296; $p \leq .001$; beta = .291; $p \leq .001$, respectively). The direct paths from attitudes to behavior and from norms to behavior were both non-significant.

The paths from past experience to intention (beta = .107, $p \leq .05$) and from past experience to behavior (beta = .146, $p \leq .009$) reflect support for the second hypothesis (see Figure 1). That is, for the entire sample, there is both a direct and indirect relationship of past experience on behavior.

Figures 2 and 3 depict analyses conducted with the female and male subsamples to test the third hypothesis. Because between-group comparisons are the focus of

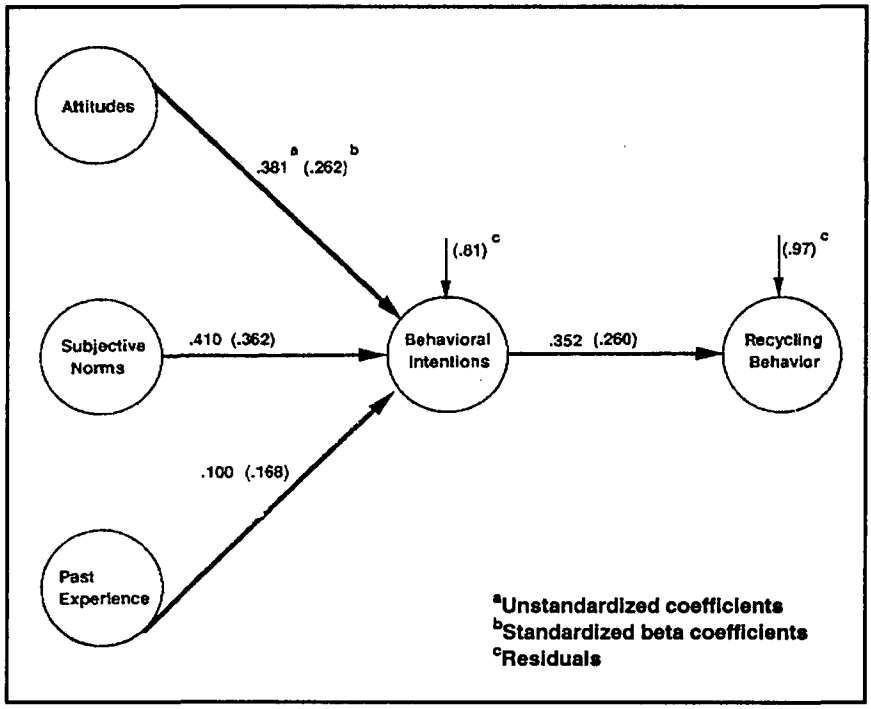

Figure 2. Path analysis of recycling behavior. Females: n = 149.

these analyses, unstandardized coefficients are reported. Standardized coefficients also are depicted. In accordance with the TRA model and the findings reported previously, attitudes and subjective norms were directly related to intentions but not to behavior for both females and males. For females, subjective norms had the greatest impact on intentions, followed by attitudes. For males, attitudes had a greater impact on intentions than norms. The two most striking gender differences include: 1) past experience was related to behavioral intentions (but not to behavior) for females (beta = .100; $p \leq .02$) and past experience was related to behavior (but not to behavioral intention) for males (beta = .131; $p \leq .02$), and 2) the relationship between intentions and behavior was significant for females (beta = .352; $p \leq .01$) but not for males (beta = .156; $p \leq .168$) value not shown (Multiple R comparison: $z = 1.85$ $p \leq .03$).

Finally, the difference in the amount of explained variance in behavior between females and males was not statistically significant (5% for females and 4% for males). There was a substantial difference, however, in the amount of variance explained in behavioral intentions (adjusted R^2 = .34 for females and .19 for males).

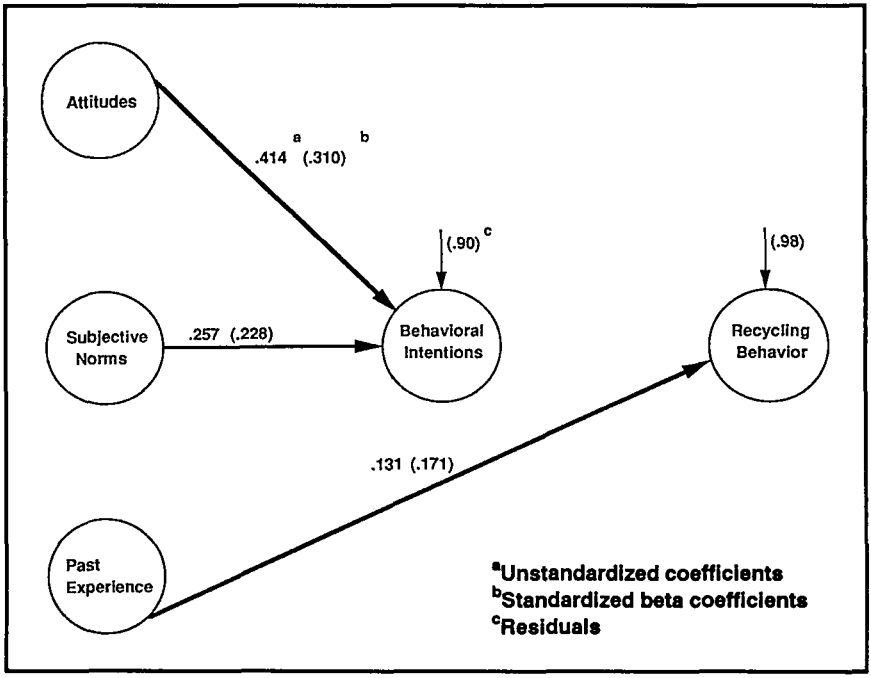

Figure 3. Path analysis of recycling behavior. Males: n = 200.

DISCUSSION

Results from the present study provide limited support for Fishbein and Ajzen's theory of reasoned action within the substantive area of paper recycling [2]. As the original model hypothesizes, only intent to behave had a direct effect on behavior while attitudes and norms were indirectly related to behavior through their direct effect on intentions. These results support findings from other studies of environmentally-related behavior in which the TRA is tested [9, 12]. An additional finding from the present study supporting previous research is that having past experience with recycling added explanatory power to the originally specified model [11, 15-17]. Because path analysis and longitudinal data were used in this study, the results reported here are even more compelling in terms of identifying the underlying causal structure of the model and assessing its application to recycling behavior. The added support should encourage continued testing of the model both within the recycling arena as well as across different environmentally-related behaviors. Also, the findings can be used as a spring-board to developing theoretically-based interventions.

With respect to the application of the theory to intervention development, it appears that intention to behave and past experience are the best predictors of future behavior. Thus, interventions should be designed to enhance pro-environmental attitudes and norms in order to foster intentions to recycle. Also, the data suggest that it might be advantageous to first implement simple hands-on recycling programs to increase participants behavioral experience which will ultimately promote future pro-environmental behavior.

Intentions played a mediating role between subjective norms, attitudes, and behavior for both females and males. For females, however, subjective norms explained more of the variance in behavioral intentions than did attitudes. For males, the opposite was true. This finding supports the notion that adolescent females may be more susceptible to social pressure from family, friends and peers [18]. Two additional unexpected gender differences were found: 1) past experience affected only intentions for females and only behavior for males, and 2) for males, there was no effect of intentions on behavior, rather only past experience helped explain recycling behavior. This pattern of significant gender differences adds to the literature that examines the relationship between gender and environmental attitudes and behaviors [20]. The findings reported here suggest that there may be a need to develop gender-specific interventions aimed at increasing recycling behavior. For female adolescents, for example, it may be important to modify the beliefs and behaviors of referent others as well as focusing on the respondents attitudes. For males, attempting to modify attitudes as well as providing some type of direct recycling experience may be the key to enhancing recycling behavior.

As is typical with exploratory research, findings from the present study suggest that there are unmeasured variables that might help explain the variance in recycling behavior. For example, social pressure, level of political activism, and subjective beliefs about behavioral barriers might have increased the explanatory power of the model and are recommended for inclusion in future research.

One unexpected finding was the extremely low magnitude of the relationship between intentions and behavior. In part, this finding may be explained by the five-month lag time between the measurement of intentions and behavior. Although a shorter time interval would have been preferable, logistical considerations made this impossible for the present study. Stutzman and Green suggest that behavioral intentions lose potency when the time lag is greater than two months [9].

There are a number of additional limitations to the present study. The exclusive focus on newspaper recycling and the reliance on a behavioral outcome that was self-reported rather than an objective measure limits the generalizability of the findings. Also, these findings cannot be interpreted as being immediately generalizable to other target groups because of the restricted age range of the population studied. Finally, attrition between the administration of the

initial and follow-up questionnaire resulted in a final sample that reported more pro-environmental attitudes than the baseline sample. Thus, the results reported here may not accurately estimate the magnitude of the significant paths. The results are compelling enough, however, to warrant further study among different populations.

In conclusion, the TRA is useful for understanding and explaining newspaper recycling behavior, at least among university students living in residence halls. In addition to the relationships hypothesized in the original model, past experience increased the explanatory power of the model and its inclusion is recommended for future TRA-based research. To increase intention to recycle, results suggest that effective interventions should educate individuals about the importance of recycling, address attitudes about participating in the behavior, and attempt to include significant network members. The path between intentions and behavior is another story, however. Making the behavior more convenient for individuals [28], or providing individuals with the procedural information or concrete knowledge may be necessary to carry out the behavior [22].

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