ORIGINAL ARTICLE

Predictive Factors of Waste Separation Behavior in Housewives in Shushtar City: An Application of Value-Belief-Norm Theory

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Abstract

Introduction: Waste management is a critical issue in urban planning, posing a significant challenge for modern societies. As populations grow and urbanization increases, the volume of waste generated also rises, putting pressure on existing infrastructure and ecosystems. Therefore, this research was designed and implemented to investigate the predictors of waste separation behavior among housewives based on the Value-Belief-Norm (VBN) Theory.

Methods: This cross-sectional study was conducted in 2023 on housewives living in Shoushtar city, Khuzestan province, Iran. Data were collected using a researcher-made questionnaire developed based on the Value-Belief-Norm Theory. The data were analyzed using SPSS 28 and AMOS 28 software at a significance level of $p<0.05$. Pearson's correlation coefficient, multiple linear regression, and structural equation modeling were employed for data analysis.

Ethical Consideration: The study was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.SCHEANUT.REC.1402.119).

Results: The mean age of the participants was 36.10±9.93 years. Pearson's correlation analysis showed significant correlations between waste separation behavior and the constructs of the Value-Belief-Norm Theory. The strongest correlations were observed with altruistic values ($r=0.344$, $p<0.001$) and intention ($r=0.435$, $p<0.001$). However, egoistic values, biospheric altruism, the New Environmental Paradigm (NEP), and descriptive norms did not significantly affect behavior. The proposed model explained 37% of the variance in waste separation behaviors.

Conclusion: The results suggest that the VBN theory framework is useful in predicting waste separation behaviors. Among the constructs, human altruism, awareness of consequences (AC), personal norms (PN), injunctive norms, and intention were identified as the most important predictors of adherence to waste separation behaviors.

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Keywords: Waste Management; Health Behavior; Value-Belief-Norm Theory; Waste Separation; Housewives; Environmental Health

Introduction

Effective waste management is a vital aspect of urban development and remains a significant challenge for modern societies. Rapid population growth and urbanization have led to a substantial increase in waste generation, placing considerable strain on infrastructure and natural ecosystems. Implementing robust waste management policies is crucial to safeguard public health, foster environmental sustainability, and ensure the long-term viability of urban centers.[1] Improper waste disposal presents significant environmental and health challenges worldwide.[2] Municipal solid waste (MSW) generation is expected to reach approximately 3.4 billion tons by 2050[3], driven by population growth, urbanization, economic development, and evolving consumption patterns.[4] In Iran, the situation reflects a missed opportunity: despite over 60% of the waste being biodegradable and thus suitable for recycling and composting,[5] only about 8% of municipal waste is recycled.[6] Currently, the total amount of municipal solid waste generated annually in Iran is estimated at approximately 50,000 tons per day. Although a significant portion of this waste is recyclable and over 60% has high potential for composting, only about 8% of municipal waste is actually recycled. The majority is disposed of through predominantly unsanitary landfilling methods.[5] A lack of sufficient funding for waste transportation and the limited public participation in recycling activities are among the main contributing factors to the growing concern over household waste disposal in Iran.[7] Since women constitute more than half of the global population, they play a fundamental role in the health and sustainable development of their communities and countries, as well as in the preservation of Earth's ecosystems, biodiversity, and natural resources. Therefore, it is essential to consider their involvement when examining and analyzing environmental issues.[8] Women, especially housewives, play a vital role in household waste management due to their central presence in kitchens, key sites of recyclable waste generation. Through waste separation and promoting sustainable consumption, they significantly contribute to environmental protection.[9]

Household waste separation is a crucial strategy for reducing landfill volume and facilitating recycling, thereby conserving natural resources and reducing energy consumption and greenhouse gas emissions. Proper sorting of recyclables such as paper, plastics, glass, and metals significantly contributes to environmental sustainability.[10] Health education and promotion interventions based on behavioral theories have proven effective in fostering waste separation behaviors by addressing psychological, social, and environmental determinants.[11, 12]

Understanding the factors that influence waste separation is essential for designing effective educational programs. Stern's Value-Belief-Norm (VBN) theory provides a robust framework for examining waste separation behavior, considering how individual values, beliefs, and personal norms interact to shape environmental actions.[13] The theory suggests that personal beliefs act as intermediaries between individual norms or values and actual behavior.[14] This framework incorporates the willingness-to-pay theory as part of its analytical foundation.[15] The model comprises personal norms, beliefs, and values, which are further elaborated through components such as ascription of responsibility (AR), awareness of consequences (AC), the New Environmental Paradigm (NEP), value orientation, and personal norms (PN). These factors operate within interconnected causal chains, forming a coherent logical sequence.[16] Values are typically classified into three groups: egoistic, altruistic, and biospheric. This framework emphasizes the importance of promoting altruistic and biospheric values, increasing awareness of environmental consequences, and strengthening individuals' sense of responsibility to encourage pro-environmental behavior. These value categories motivate individuals to address environmental concerns and actively participate in sustainable practices.[17] Understanding the interactions among these elements enables policymakers, educators, and advocates to develop targeted strategies that promote environmental stewardship and sustainable decision-making.[18] According to VBN theory, values shape beliefs, which are expressed through an ecological worldview. This worldview influences awareness of behavioral consequences and the ascription of responsibility, leading to the formation of personal norms that ultimately predict behavior.[17, 19] The VBN framework particularly emphasizes recognizing negative environmental outcomes and assigning responsibility, intervening in individuals' psychological motivation through a series of moral and emotional mediators, thereby promoting pro-environmental actions.[20] Raghu et al. reported that waste separation behaviors are not limited to attitudes and intentions and recommended that policymakers should focus on values and beliefs to strengthen the voluntary, involuntary, cognitive, and normative processes influencing waste separation.[21]

Despite the critical importance of waste separation, limited research has explored its behavioral determinants, particularly among key household actors, such as housewives. This study aims to fill this gap by investigating the predictors of waste separation among housewives in Shushtar, Iran, using the VBN theory. Given their pivotal role in household waste management, housewives are a key target group for interventions aiming at promoting sustainable waste practices.

Table 1: Characteristics of the Measurement Scales of the Tool Constructs

Construct	Number of Items, Scoring (Range)	Sample of Items	CVR	CVI	Reliability
Knowledge: An individual must acquire facts and understanding regarding an action, idea, object, person, or situation[22]	15 items, yes. No. I don't know (15-45)	Are disposable paper containers recyclable?	0.63	0.81	0.72
Egoistic values: These values are driven by self-interest, where individuals prioritize maximizing their personal, particularly economic, benefits	5 items from 1 completely disagree to 5 completely agree (5-25)	I will separate the waste if I pay for it	0.81	0.81	0.74
Altruistic humans: People with these values focus on promoting the well-being of other human groups, aiming to enhance the community's interests. However, altruistic values typically overlook the needs of non-human species.	4 items from 1 completely disagree to 5 completely agree(4-20)	I like to help preserve resources for future generations by separating waste	0.81	0.72	0.87
Altruism biosphere: These values emphasize the importance of individuals considering not only the well-being of human groups but also the welfare of nonhuman species when engaging in certain actions	4 items from 1 completely disagree to 5 completely agree(4-20)	I respect the planet by separating waste.	0.95	0.91	0.81
New Environmental Paradigm(NEP): NEP represents a widely recognized environmental worldview that reflects individuals' perceptions about humanity's ability to disturb the natural balance, the potential limitations on societal growth, and humans' rights to control nature	5 items from 1 completely disagree to 5 completely agree(5-25)	I believe that waste separation has an effect on the life and survival of plants and animals.	0.81	0.72	0.67
Awareness of consequences(AC): AC refers to an individual's recognition of the harmful effects their actions, particularly anti-social behaviors, may have on others or the environment.	6 items from 1 completely disagree to 5 completely agree(6-30)	Failure to separate waste increases the Earth's heat.	0.81	0.90	0.81
Ascription of responsibility to self(AR): This refers to the sense of accountability an individual feels for the negative consequences of failing to act in a pro-social manner.	3 items from 1 completely disagree to 5 completely agree(3-15)	We are all responsible for the environmental problems caused by not separating waste	0.81	0.72	0.94
Personal norms(PN): This pertains to an individual's sense of moral duty to either engage in or avoid certain behaviors [23]	**9** items from 1 completely disagree to 5 completely agree(9-45)	I do not feel obliged to separate the waste.	0.63	0.90	0.60
injunctive norms: These are societal expectations regarding how people should behave, representing the standards of acceptable behavior within a community[24]	**5** items from 1 completely disagree to 5 completely agree(5-25)	My family members confirm my concerns about the environment	0.81	0.72	0.88
Descriptive norms: Descriptive norms are influential concepts that help explain how people in a given culture typically behave, complementing the value-based approach in cross-cultural psychology.[25]	**3** items from 1 completely disagree to 5 completely agree(3-15)	Most of my friends separate waste at home.	1	1	0.83
Skills: facility, proficiency, or dexterity that is acquired or developed through training or experience[16]	**4** items from 1 completely disagree to 5 completely agree(4-20)	I can properly separate household waste.	095	092	0.90
Affordable service: both on the price of a health intervention and on the financial means of the person or organization paying for it.[17]	**3** items from 1 completely disagree to 5 completely agree(3-15)	In our neighborhood, the municipality provides my family with special containers for waste separation.	0.81	1	086
Social support: This refers to the social resources that individuals perceive as available or that are actually provided by non-professionals, either through formal support groups or informal helping relationships.[26]	6 items from 1 completely disagree to 5 completely agree(6-30)	Whenever I have a question about waste separation, there are people to give me information.	0.81	1	0.78
Intention: This reflects the degree to which housewives are motivated to perform and pursue the behavior[27]	8 items from 1 completely disagree to 5 completely agree(8-40)	In the near future, I plan to separate plastic waste, such as plastic containers, etc., from other waste at home.	1	1	0.80
Behavior: Behavior refers to the act of participating in household waste separation by housewives, driven by their intention[28]	6 items from 1 completely disagree to 5 completely agree(6-30)	Have you separated paper waste in the last two weeks?	0.81	1	0.81

CVR=Content Validity Ratio; CVI=Content Validity Index; NEP=New Environmental Paradigm; AC=Awareness of Consequences; AR=Ascription of Responsibility .PN=Personal Norms

Methods

A cross-sectional study was conducted in Shoushtar, Khuzestan Province, Iran, in 2023. A total of 289 housewives were recruited through a probabilistic multistage random sampling method to ensure representativeness. The sampling process involved selecting housewives from five urban comprehensive health service centers in Shoushtar, employing a randomized selection via random number tables applied to the registries of each center. This sampling method was chosen to enhance the generalizability of the results and reduce selection bias.

Data Collection

The researcher-developed questionnaire consisted of 91 items, including 5 questions related to demographic characteristics, 15 questions about knowledge, egoistic values (5 questions), altruistic values (4 questions), biosphere values (4 questions), worldview New Environmental Paradigm (5 questions), consequence awareness (6 questions), the responsibility ascription to self (3 questions), personal norm (9 questions), injunctive norm (5 questions), descriptive norm (3 questions), skill (4 questions), affordable service (3 questions), social support (6 questions), intention (8 questions), and behavior (6 questions).

The data were analyzed using SPSS 28 and AMOS 28 software at a significance level of $p<0.05$. Pearson's correlation coefficient, multiple linear regression, and structural equation modeling were employed for data analysis.

Reliability and Validity of the Tool

The content validity of the tools was assessed by calculating the content validity ratio (CVR) and content validity index (CVI) following the feedback from 11 experts in environmental health, health promotion, and health education. The average CVI score was 0.81, while the average CVR score was 0.84. The reliability of the tool was evaluated through measures of stability and internal consistency.

The internal consistency was assessed by Cronbach's alpha coefficient, considering the sample size of 30 individuals independent of the primary study group, which was found to be 0.87. Furthermore, the test-retest evaluated the stability of the scale. After two weeks, 30 individuals re-completed it, and the correlation coefficient between the two sets of scores was calculated. The correlation coefficients of the tool were 0.82 to 0.92 (Table 1).

Sample size determination was informed by the methodology of HaghighatJoo et al. (2020)[8] and calculated using NCSS PASS 15 software, considering a confidence level of 95% ($\alpha=0.05$), margin of error ($d=0.05$), and an anticipated non-response rate of 10%, yielding a minimum required sample of 252 participants. Therefore, the actual sample of 289 exceeds this threshold to ensure sufficient statistical power.

Inclusion and Exclusion Criteria

Eligible participants who met the inclusion criteria were requested to provide written informed consent before enrollment in the study. Proficiency in the Persian language, including literacy skills, was mandatory. Moreover, individuals with no significant physical impairments that could compromise their capacity to complete the questionnaire were considered eligible. Participants who failed to complete the questionnaire fully were subsequently excluded from the analysis.

Ethical Considerations

This study was approved by the Ethics Committee of "Shiraz University of Medical Sciences" (Ethics code: IR.SUMS.SCHEANUT.REC.1402.119). All participants provided written informed consent before their inclusion in the research.

Table 2: Participants' Demographic Profile: Frequency and Distribution

Variable	Mean (SD) / Percent	N
Age	36.10 (9.93)	—
Marital Status		
- Single	5.9%	16
- Married	94.1%	273
Education		
- Below Diploma	29.1%	84
- Diploma	28.1%	110
- Graduate	32.9%	95
Spouse's Education		
- High school	31.5%	91
- Diploma	32.2%	96
- Graduate	29.8%	86
Women's Occupation		
- Unemployed	10.7%	31
- Employed	68.9%	199
- Retired	14.8%	43

Results

According to Table 2, the study participants were categorized based on several variables, including age, education status, spouse's education, the women's own occupation, and marital status. In general, there were 289 participants with a mean age of 36.10±9.93 years. The distribution of educational levels showed that 29.1% of women had an education below a diploma, 38.1% had a diploma, and 32.9% had a university education. The detailed sociodemographic characteristics of the participants are presented in Table 2.

Table 3 presents the correlation coefficients among the variables based on the Value-Belief-Norm (VBN) theory constructs and waste separation behaviors. Bivariate Pearson correlation analysis showed statistically significant positive associations between waste separation behavior and constructs such as altruism humans (r=0.275, p<0.001), altruism biosphere (r=0.247, p<0.001), awareness of consequences (AC) (r=0.154, p<0.001), personal norms (PN) (r=0.304, p<0.001), injunctive norms (r=0.271, p<0.001), and intention (r=0.379, p<0.001). However, no significant correlations were found between waste separation behavior and Egoistic values (r=0.033, p=0.57), New Environmental Paradigm (NEP) (r=0.023, p=0.69), or descriptive norms (r=0.071, p=0.22) (Table 3).

Multiple linear regression analysis was performed to assess the effect of VBN constructs on waste separation behaviors. As shown in Table 4, altruism humans (β=0.344, p=0.001), awareness of consequences (AC) (β=0.118, p=0.002), personal

Table 3: Correlation Coefficients among VBN Theory Variables and Waste Separation Practices

Variables	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11
1. Behavior	19.88 (3.52)	1	0.233**	0.315**	0.247**	0.023	0.154**	0.163**	0.304**	0.071	0.271**	0.379**
2. Egoistic values	21.27 (6.42)	0.033	1	0.482**	0.377**	0.110	0.252**	0.279**	0.272**	0.108	0.143**	0.331**
3. Altruistic humans	17.45 (2.90)	0.275**	0.489**	1	0.743**	0.088	0.419**	0.442**	0.576**	0.177**	0.371**	0.555**
4. Altruism biosphere	15.40 (2.31)	0.247**	0.377**	0.743**	1	0.152**	0.345**	0.445**	0.532**	0.268**	0.384**	0.462**
5. New Environmental Paradigm (NEP)	15.53 (4.21)	0.023	0.110	0.088	0.152**	1	0.133**	0.129**	0.176**	0.166**	0.076	0.058
6. Awareness of consequences (AC)	26.58 (8.72)	0.154**	0.252**	0.419**	0.345**	0.133**	1	0.458**	0.410**	0.092	0.228**	0.364**
7. Ascription of responsibility (AR)	11.71 (2.23)	0.163**	0.279**	0.442**	0.445**	0.129**	0.458**	1	0.594**	0.247**	0.398**	0.350**
8. Personal norms (PN)	36.07 (5.05)	0.304**	0.272**	0.576**	0.532**	0.176**	0.410**	0.594**	1	0.400**	0.635**	0.477**
9. Descriptive norms	9.69 (4.45)	0.071	0.108	0.177**	0.268**	0.166**	0.092	0.247**	0.400**	1	0.396**	0.198**
10. Injunctive norms	18.95 (4.89)	0.271**	0.143**	0.371**	0.384**	0.076	0.228**	0.398**	0.635**	0.396**	1	0.367**
11. Intention	33.10 (6.08)	0.379**	0.331**	0.555**	0.462**	0.058	0.364**	0.350**	0.477**	0.367**	0.198**	1

SD=Standard Deviation; NEP=New Environmental Paradigm; AC=Awareness of Consequences; AR=Ascription of Responsibility; PN=Personal Norms

Table 4: Multiple Linear Regression Examining the Effects of VBN Constructs on Waste Separation Behaviors

Variables	Unstandardized Coefficients (B)	SE	Standardized Coefficients (β)	t	p
Constant	4.630	2.609	—	1.775	0.001
Egoistic values	0.124	0.096	0.072	1.280	0.541
Altruism humans	0.721	0.186	0.344	3.881	0.001
Altruism biosphere	0.075	0.202	0.029	0.373	0.710
New Environmental Paradigm (NEP)	0.042	0.077	0.029	0.540	0.590
Awareness of consequences (AC)	0.156	0.121	0.118	2.083	0.002
Ascription of responsibility (AR)	0.134	0.170	0.013	2.200	0.07
Personal norms (PN)	0.237	0.231	0.122	2.541	0.004
Descriptive norms	0.123	0.179	0.022	1.735	0.191
Injunctive norms	0.183	0.221	0.017	2.314	0.003
Intention	0.088	0.032	0.435	2.761	0.001
Adjusted R^2=0.370 p<0.001					

SE=Standard Error; β=Standardized Regression Coefficient Adjusted; R^2=Adjusted Coefficient of Determination

norms (PN) (β=0.122, p=0.004), injunctive norms (β=0.017, p=0.003), and behavioral intention (β=0.435, p<0.001) were significant positive predictors of waste separation behavior. Egoistic values (β=0.072, p=0.541), altruistic biosphere (β=0.029, p=0.710), New Environmental Paradigm (NEP) (β=0.029, p=0.590), and descriptive norms (β=0.022, p=0.191) did not significantly predict behavior. The model explained 37% of the variance in waste separation behavior (adjusted R^2=0.37).

Discussion

The present study aimed to identify key determinants of compliance with waste separation guidelines, using the Value-Belief-Norm (VBN) framework in 2023. Results revealed significant positive associations between waste separation behavior and constructs such as altruistic human values, awareness of consequences (AC), personal norms (PN), injunctive norms, and behavioral intention.

Pearson correlation analyses confirmed strong positive relationships, with altruistic human values (r=0.344, p<0.001) and behavioral intention (r=0.435, p<0.001) showing the most robust correlations. Conversely, egoistic values, biospheric altruism, the New Environmental Paradigm (NEP), and descriptive norms did not significantly influence waste separation behavior. The results showed that altruistic human values and behavioral intention were the strongest predictors of this behavior, with the research model explaining 37% of the variance, indicating a moderate level of explanatory power.

These findings highlight the stronger role of altruistic human values over egoistic values in promoting environmentally responsible behaviors. This insight is crucial for developing strategies to encourage the adoption of sustainable behavior at both the individual and community levels. Supporting prior research, previous studies have similarly reported these findingselaborating that altruistic values indirectly foster pro-environmental actions through enhanced environmental awareness, personal responsibility, and norms.[28, 29]

In recent years, the discourse surrounding environmental behavior has gained considerable traction, highlighting the complex interplay between individual intentions and actions. A pivotal study was conducted. Similar findings have been reported previously, highlighting the importance of behavioral intention as a primary determinant of environmental behaviors.[30] This assertion aligns with the findings of the present study, which also identifies behavioral intention as a crucial factor motivating environmentally responsible actions. Behavioral intention, as delineated in their research, serves as both a predictor and a catalyst for individuals who aspire to engage in pro-environmental practices.

Furthermore, the consistency of our results with those of Peyman and Samiei-Rudi reinforces the robustness of this correlation. Their research also highlights behavioral intention as a key contributor to the manifestation of pro-environmental behaviors, thereby corroborating the premise that intention shapes individual actions in this crucial area.[31]

Strengths and Limitations

The strengths of our research include providing valuable insights into the specific role of housewives in waste management, a group largely overlooked in previous studies. By focusing on this often-neglected demographic, our study enhances the understanding of household waste management behaviors and their broader environmental impact. One limitation of the present study is the reliance on questionnaires for data collection. This method may be prone to response biases, such as exaggerated reports or inaccuracies, and may also encounter non-cooperation in completing the survey. Furthermore, the small sample size limits the generalizability of the findings to broader populations.

Suggestions for Future Research

Future research should conduct longitudinal studies to evaluate the lasting effects of waste management education, include larger and more diverse samples to enhance the generalizability of findings across populations, and investigate the impact of cultural and socioeconomic variables on the effectiveness of educational programs.

Conclusion

This study demonstrates that the Value-Belief-Norm (VBN) theory is a useful framework for explaining and predicting waste separation behavior. Key factors such as altruistic values, awareness of consequences, personal norms, injunctive norms, and behavioral intentions significantly influence the individuals' compliance with waste separation guidelines. Therefore, programs aiming at encouraging waste separation, especially among housewives in Shoushtar city, should focus on strengthening these factors to achieve better adherence.

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Authors' Contribution

KJ: Conceptualization, Data collection, Investigation, Writing – Original Draft.MK: Methodology, Supervision, Statistical analysis. ZD: Validation, Environmental health consultation, Manuscript review. LG: Supervision, Project administration, Writing – Review & Editing.

Data Availability

The dataset is available upon request from the corresponding author, either during the submission process or after the publication.

Ethical Approval

(IR.SUMS.SCHEANUT.REC.1402.119)

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Informed Consent

The subjects were informed about the confidentiality of the study and its objectives; then, they provided written informed consent to participate.

Conflict of Interest Not Conflict of Interest.

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