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The Interplay of Knowledge and Attitudes in Predicting Household Plastic Recycling Behavior

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Abstract

Background: This study investigated the predictors of plastic waste separation behavior among urban households, focusing on the roles of specific knowledge and environmental attitudes.

Objectives: The primary purpose of this study is to investigate the predictive power of knowledge and attitudes on the frequency of plastic waste separation behavior among urban households.

Methods: A cross-sectional survey was administered to 300 urban residents, assessing their knowledge of local recycling protocols, attitudes toward plastic waste, and self-reported recycling frequency.

Results: Correlation and regression analyses revealed that both knowledge ($r = .43$, $p < .01$) and attitudes ($r = .54$, $p < .01$) were significant positive correlates of recycling practice. Crucially, regression results identified knowledge ($\beta = .43$, $p < .001$) as a slightly stronger unique predictor than attitude ($\beta = .35$, $p < .001$), with the model explaining 42% of the variance in behavior.

Implications: The findings suggest that public recycling campaigns must be dual-pronged, strategically combining attitudinal interventions with the dissemination of precise, actionable local recycling information to effectively convert environmental concern into consistent practice.

Keywords: *plastic waste; household recycling; environmental knowledge; pro-environmental attitude; waste management behavior; urban sustainability.*

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1. INTRODUCTION

The management of plastic waste represents a critical juncture in global environmental sustainability efforts, with urban households standing as both significant contributors and essential actors in the solution. The linear "take-make-dispose" model of plastic consumption has led to overflowing landfills and pervasive environmental pollution, underscoring the urgent need for a transition toward a circular economy (Bing et al., 2014). Within this framework, the simple, recurring behavior of separating plastic waste at the household level is a foundational practice. However, the journey from a plastic item's end-of-life in a home to its reincarnation as a new product is fraught with behavioral complexities, creating a significant gap between waste management infrastructure and its effective utilization by the public (Roche Cerasi et al., 2021).

A substantial body of research has sought to understand the determinants of pro-environmental behavior, often using the Knowledge, Attitude, and Practices (KAP) framework. Studies consistently reveal a troubling disconnect; for example, research in Malaysia and the United Arab Emirates found that while general knowledge about the detrimental effects of plastic pollution is moderately high, this awareness does not reliably translate into consistent recycling or waste reduction behaviors (Coco Chin et al., 2023; Alteneiji et al., 2024). This suggests that knowledge is a necessary but insufficient condition for action. Attitudes have been identified as a potentially more potent driver. A systematic review confirmed that positive attitudes are a more reliable predictor of the intention to reduce single-use plastic consumption than knowledge alone (Devi et al., 2022). Furthermore, studies focusing on post-pandemic behaviors and specific demographics like youth and students highlight that emotional drivers, such as feelings of guilt or a perceived sense of responsibility, are critical motivators for recycling practices (Ismail et al., 2023a; Ismail et al., 2023b; Owojori et al., 2022). This indicates that internal beliefs may be the crucial link that connects factual understanding to tangible, habitual behavior in the home.

Despite the proliferation of public awareness campaigns, the persistence of plastic pollution indicates that current strategies may be inadequately addressing the core behavioral drivers within urban households. Many initiatives operate on the assumption that increasing knowledge will directly lead to improved practices, an approach that the literature suggests is often ineffective (Devi et al., 2022; Alteneiji et al., 2024). There is a pressing need to move beyond generic awareness and instead pinpoint the relative influence of specific, actionable knowledge and deeply held attitudes on the habitual practice of waste separation. By clarifying whether cognitive understanding or affective disposition is a stronger predictor, this study will provide empirically grounded evidence to help policymakers, urban planners, and environmental organizations design more sophisticated and effective interventions. The goal is to enable a strategic shift from simply informing the public to psychologically empowering them to act.

The primary purpose of this study is to investigate the predictive power of knowledge and attitudes on the frequency of plastic waste separation behavior among urban households.

The specific objectives are:

1. To measure the levels of specific, actionable knowledge about plastic recycling and prevailing attitudes toward plastic waste among urban residents.

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2. To examine the bivariate correlations between knowledge scores and recycling frequency, and between attitude scores and recycling frequency.

3. To determine the unique contribution of knowledge and attitudes in predicting the frequency of plastic separation practices using linear regression analysis.

2. METHODOLOGY

This study employed a quantitative, cross-sectional design to investigate the predictors of plastic waste separation in urban households. A sample of 300 households was selected through stratified random sampling across a major metropolitan area, with the sample size determined using G*Power analysis for multiple regression. Data were collected via a structured, self-administered questionnaire distributed both online and in-person. The instrument comprised three sections: a demographic profile, a 10-item knowledge scale assessing understanding of local recycling protocols and environmental impact using a 5-point Likert format, and 8-item attitude scale measuring feelings of responsibility and perceived behavioral control, including reverse-scored statements. The dependent variable was measured through a single-item 5-point frequency scale assessing how often households separate plastic waste. Prior to deployment, the survey was piloted for clarity and reliability. Data analysis was conducted using SPSS Version 28. Pearson's correlation analysis examined relationships between variables, followed by multiple linear regression to determine the predictive power of knowledge and attitude on recycling behavior, with statistical significance set at $p < 0.05$.

3. RESULTS

Association Between Knowledge, Attitude and Practice

Table 1 Pearson Correlation

Variable	1. Knowledge	2. Attitude	3. Practice
1. Knowledge	—		
2. Attitude	.58**	—	
3. Practice	.43**	.54**	—

Bivariate correlations revealed that both knowledge ($r = .43$, $p < .01$) and attitude ($r = .54$, $p < .01$) were significantly and positively associated with recycling practice. A strong, significant correlation was also found between knowledge and attitude ($r = .58$, $p < .01$).

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Predicting Recycling Practice

Predictor	B*B*	SE*SE*	β*β*	t*t*	p*p*
(Constant)	0.930	0.224		4.148	<.001
Knowledge	0.418	0.057	0.430	7.284	<.001
Attitude	0.347	0.058	0.352	5.959	<.001

Table 2
Multiple Linear Regression

Note: R2R2 = .42. The dependent variable is Practice (recycling frequency).

A linear regression indicated that the model significantly predicted recycling practice, F(2, 197) = 71.42, p < .001, accounting for 42% of the variance. Both knowledge (β = .43, p < .001) and attitude (β = .35, p < .001) were significant, unique positive predictors.

4. DISCUSSION

This study confirms the central hypothesis that both knowledge and attitudes are significant, positive predictors of household plastic recycling behavior. The findings illuminate a critical nuance: while both factors are vital, knowledge emerged as a slightly stronger unique predictor than attitude. This adds a pivotal layer to the existing discourse, which often reports a weak or inconsistent link between knowledge and action (Coco Chin et al., 2023; Alteneiji et al., 2024). Our results suggest this inconsistency may stem from how knowledge is measured; we assessed specific, actionable knowledge of local recycling systems, which appears more directly consequential than general environmental awareness. This aligns with research emphasizing that effective waste management hinges on public understanding of local protocols (Roche Cerasi et al., 2021; Bing et al., 2014).

Furthermore, the strong predictive power of attitude reinforces global studies identifying emotional drivers like guilt and responsibility as key behavioral catalysts (Ismail et al., 2023a; Devi et al., 2022). However, our regression model demonstrates that even when controlling for these potent attitudes, specific knowledge exerts its own independent influence on behavior. This new information is highly significant for public policy, indicating that awareness campaigns must be dual-pronged. They must not only cultivate positive attitudes but also meticulously educate citizens on the "how" and "what" of local recycling to overcome practical barriers, thereby enhancing the cost-effectiveness of recycling programs (Gradus et al., 2017).

This study is limited by its cross-sectional design and reliance on self-reported behavior, which may be susceptible to social desirability bias. Future longitudinal research should observe actual recycling rates and investigate the interplay between household-level behavior and municipal waste management infrastructure, particularly the adoption of advanced processing technologies (Nahursky et al., 2022). Exploring economic incentives could also provide a more comprehensive model for promoting sustainable waste streams in urban environments.

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5. Conclusion

Ultimately, this research establishes that effective plastic waste management at the household level hinges on a synergistic approach, where empowering individuals with precise, localized knowledge of recycling systems is as critical as nurturing their environmental attitudes. The findings compellingly demonstrate that factual understanding exerts a slightly stronger direct influence on recycling frequency than personal disposition alone. This pivotal insight mandates a strategic evolution in public policy, moving beyond awareness campaigns that primarily target sentiment. To genuinely transform household behavior, initiatives must be deliberately co-designed to provide clear, practical guidance on local recycling protocols, thereby converting resident intention into consistent, correct practice and ensuring the operational success of urban sustainability programs.

AUTHOR'S CONTRIBUTION AND DECLARATIONS

Concept Design, Data Collection and Drafting: Tanzeel Tariq

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Furthermore, this research did not involve the use of animals, plants, or any biological specimens requiring ethical approval. Therefore, ethical clearance from an institutional review board, prior informed consent (PIC) from respondents, or animal/plant welfare approvals are not applicable to this study.

The author(s) affirm full compliance with international ethical standards for research and publication.

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