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Exploring Factors Influencing on Urban Residents' Environmental Responsible Behaviour in Urban Green Space of Henan Province, China

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Abstract: One of the main research directions in current environmental responsibility behavior is to explore its influencing factors. Therefore, this study constructs a two-dimensional model of "cognition + affective → behavior" to analyze the influencing mechanism of "cognition" and "affection" factors on urban residents' environmental responsibility behavior (URERB). Among them, environmental knowledge (EK) as an explanation of environmental cognitive factors, and place attachment (PA) and anticipated emotions (AE) as an explanation of environmental affective factors, are considered as independent variables; URERB is the dependent variable. Based on this model, three research hypotheses are proposed. The research results show that: 1) "cognition + affective" factors can effectively assess the influencing factors of URERB; 2) environmental knowledge has a positive impact on URERB; 3) place attachment has a direct and significant positive effect on URERB; 4) anticipated emotions do not show a direct and significant impact on URERB. Therefore, by implementing the "cognition + affective" strategy, urban green spaces can effectively promote URERB and stimulate urban residents' proactive participation in environmental protection.

Keywords: Environmental knowledge, Place attachment, Anticipated emotions, Environmental responsibility behavior, Urban green spaces.

1. Introduction

With the expansion of urban population, the urban green spaces in China are affected by the irresponsible environmental behavior of urban residents, resulting in serious ecological damage to green spaces. However, the formation mechanism of individual pro-environmental behavior has not been fully clarified (Qiu et al., 2018), and the research on the influencing factors of urban residents' environmental responsibility behavior is even scarcer. Therefore, it is crucial to clarify the influencing mechanisms of environmental responsibility behavior (WANG & WU, 2015). Many scholars have discussed the influencing factors of environmental responsibility behavior from the cognitive and affective layers, but the research on the influencing mechanisms of "cognition" and "affective" dual factors on urban residents' environmental responsibility behavior is relatively lacking. Some scholars believe that emotional factors are more important and have more driving force than rational cognitive factors in influencing individual environmental responsibility behavior (Kanchanapibul et al., 2014). Some scholars have also tried to explore the influencing factors of environmental responsibility behavior from the perspective of integrating affection and reason (Dang et al., 2021; Duan et al., 2021). "Topophilia" refers to the emotional bond between people and places, and the human-place interaction relationship that integrates place-related affection, knowledge, beliefs, and behaviors is a typical human emotional experience that can be further verified by human emotional factors (Dang et al., 2021). Anticapated emotions can influence an individual's decision-making process, and they are often used to guide current behavior choices (Mellers & McGraw, 2010). To study the importance of environmental affection in ERB, Wang Jianming constructed a dual-factor theoretical framework of affection-behavior and validated it through qualitative research and quantitative research techniques, with the results showing that environmental affection has a greater impact on low-carbon consumption behavior (J. M. Wang, 2015). The mainstream research believes that environmental knowledge is an important factor influencing environmental responsibility behavior (Liobikienė & Poškus, 2019). Based on this, this paper constructs a "cognition + affection → behavior" conceptual model consisting of four variables: "environmental knowledge", "place attachment", "Anticapated emotions", and "environmental responsibility behavior" to study the causal mechanism of urban residents' environmental responsibility behavior, with the aim of explaining the dual value of cognition and affection in urban residents' environmental responsibility behavior.

2. The Review of Literature and hypotheses

2.1. The ABC Attitude Theory

According to scholars such as Sears, the cognitive component of attitudes is an individual's knowledge and beliefs about the attitude object; the affective component is an individual's feelings towards the attitude object; and the behavioral component is an individual's actions or behavioral tendencies towards the attitude object (Sears et al., 1991). The ABC attitude theory emphasizes the mutual relationship between cognition, affect, and behavior. Solomon (2015) proposed the concept of hierarchy of effects to explain the

mutual influence of these three elements. The ABC attitude theory model reflects the interchangeability and importance of the three elements of cognition, affect, and behavior at different levels, and different layers should be selected for different research scenarios.

In the research context of this study, the ABC attitude theory can be used to provide a good explanation of the formation process of urban residents' environmental responsibility behavior in green spaces.

2.2. Environmentally Responsible Behavior

Ivek and Hungerford (1990) pointed out that environmental responsibility behavior (ERB, environmentally responsible behavior) as a whole refers to an individual's spontaneous reduction in the use of natural resources or promotion of its sustainable use. The terms used in related studies mainly include environmental responsibility behavior (C. Wang et al., 2019), pro-environmental behavior (Tkaczynski et al., 2020), environmental behavior (Soares et al., 2021; Yusliza et al., 2020), eco-behavior (Dolnicar, 2020), sustainable behavior (Parmentola et al., 2022), and green behavior (Al-Swidi et al., 2021). Overall, there is no uniform standard in the existing literature for the use of terms, and no widely accepted and applied uniform term has yet emerged. This study draws on the above research and categorizes environmental responsibility behavior into compliance and proactive types.

2.3. Environmental Knowledge and Environmentally Responsible Behavior

Environmental knowledge refers to an individual's cognition of ecological and environmental protection, including knowledge about ecosystems and environmental protection measures (Fryxell & Lo, 2003). Bartkus et al. (1999) distinguished subjective knowledge from objective knowledge. Based on the theory of rational behavior and norm activation theory, Han (2021) verified through a literature review that in the case of consumption of environmental products, environmental knowledge is more conducive to activating individual environmental behavior. Stepchenkova, based on the value-attitude-behavior model, verified that there was a positive and significant link between attitudes and environmental responsibility behavior among the high-knowledge group, but no such link was found among the low-knowledge group (Kim & Stepchenkova, 2020). Saari et al. (2021) used the ISSP Environment III open dataset, employing face-to-face interviews, self-completed questionnaires, and a mixed method, to show that higher levels of environmental knowledge would have a positive impact on pro-environmental behavior. In this paper, environmental knowledge is divided into subjective knowledge and objective knowledge. Based on this, Hypothesis H1 is proposed.

H1: There is a relationship between environmental knowledge and urban residents' environmental responsibility behavior.

2.4. Place Attachment and Environmental Responsibility Behavior

Based on the perspective of place attachment, analyzing the formation mechanism of ERB has become a current research hotspot. Place attachment has always been used to describe the phenomenon of people forming emotional connections with physical environments (Inalhan et al., 2021). This emotional connection can be supplemented by functional connections, and people's dependence on the functions provided by the landscape can strengthen this connection. Vaske et al. (2001) pointed out that landscape is an important basis for the formation of place attachment, and local residents continuously strengthen their place attachment through interactions with the landscape, forming deeper emotional connections with the landscape (Vaske & Kobrin, 2001). Nasr et al. (2022) conducted a study on 375 residents in Ghana based on the stimulus-organism-response theory, and the results showed that residents' community attachment was positively correlated with their ERB. Winton analyzed 368 resident data from communities along the Mississippi Bay, and the results showed that residents who had a high degree of attachment to their living place would exhibit positive environmental responsibility behavior and support sustainable development (Winton, 2023). Based on this, Hypothesis H3 is proposed. This study draws on the two dimensions of place attachment proposed by Williams et al., namely, place identification (emotional attachment) and place dependence (functional attachment). Based on this, Hypothesis H2 is proposed.

H2: There is a relationship connection between place attachment and environmental responsibility behavior.

2.5. Anticapated Emotions and Environmental Responsible Behavior

Anticapated emotions refer to the emotional experience of an individual anticipating a yet-to-be-realized behavior outcome, and the emotions experienced in the present moment (Onwezen et al., 2013). Anticapated emotions can affect the decision-making process of individuals and often use these feelings to guide their current behavior choices (Mellers & McGraw, 2010). Environmental emotions are a key direct factor affecting environmental responsibility behavior (Duan et al., 2021) based on the perspective of integrating emotion and reason in environmental responsibility behavior research, positive and negative environmental emotions have a negative impact on individual environmental responsibility behavior and willingness to deviate (Zheng et al., 2021). In the study of the influencing factors of environmental responsibility behavior for tourists in settlement areas, nostalgic emotions are considered positive emotions of warmth, happiness, happiness, and satisfaction, which can have a significant positive impact on environmental responsibility behavior (Wu et al., 2019). In the discussion of the impact of positive emotions on environmental responsibility behavior, positive emotions are positively correlated with ethical ERB and ERB charity. It is worth noting that positive emotions have no direct impact on ERB, but can indirectly affect it through self-efficacy and sense of place (Gezhi & Xiang, 2022). In this paper, expected emotions are divided into positive emotions and negative emotions. Based on this, the following hypothesis is proposed: H3.

H3: There is a relationship between anticapated emotions and environmental responsibility behavior.

3. Theoretical Model Construction and Research Method

3.1. Theoretical Model Construction

Based on the ABC attitude theory, this study takes the perspective of place attachment and regards environmental knowledge as the "cognitive" dimension, place attachment

and anticipated emotions as the "emotional" dimension, and environmental responsibility behavior as the "behavioral" dimension. Combining the above theoretical hypotheses, this study constructs a two-dimensional structural relationship model of "cognition + emotion → behavior," as shown in Figure 1.

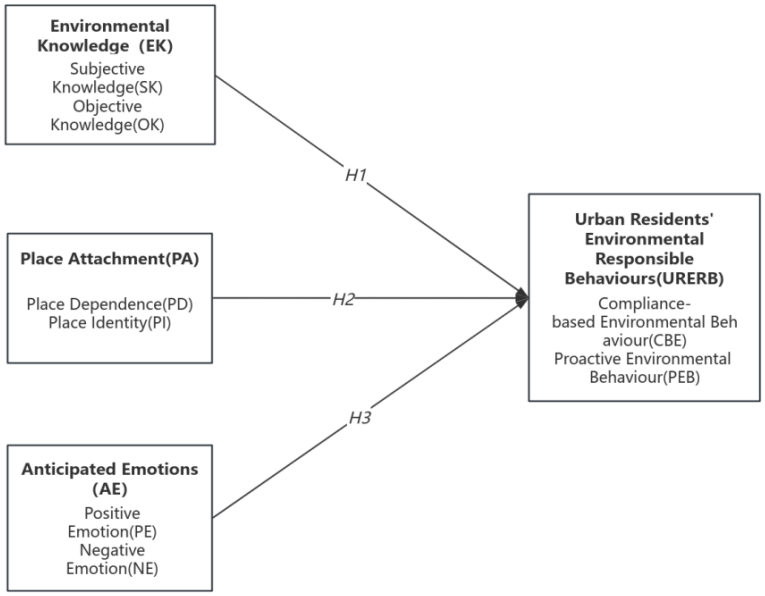

Figure 1. Conceptual framework

3.2. Research Method

This study employs a quantitative method. First, the dimensions of each variable are classified through a literature search method, and a scale for population demographics, environmental responsibility behavior, environmental knowledge, place attachment, and anticapated emotions is constructed. Data are collected through a pre-survey questionnaire, and a formal questionnaire is designed. Second, data are collected through a formal survey, and descriptive statistical analysis and reliability tests are conducted on the scales and sample basic characteristics using SPSS 24.0 software. Finally, the validity of the scales is verified using AMOS 24.0 software, and the structural relationship model is verified through analysis.

4. Data Sources and Analysis of Sample Data

4.1. Questionnaire Design and Variable Measurement

The survey questionnaire in this study consists of five parts: social demographic information, environmental knowledge scale, place attachment scale, anticipated emotions scale, and environmental responsibility behavior scale. All variables in the questionnaire use the Likert 5-point scale (1 = completely disagree, 5 = completely agree). The environmental knowledge scale is based on the work of İnci Dursun (2019). Carmi et al., (2015); Diaz-Siefer et al. (2015) study; place attachment measurement reference Liu et al. (2021); Fan Jun et al. (2014); Williams et al. (1992) study, environmental responsibility behavior reference Liu et al. (2021); Qiu (2016); etc. study, anticipated emotions reference Inci Dursun. (2019); Carmi et al., (2015); Diaz-Siefer et al. (2015) conducted a study to create an initial questionnaire and collected 164 valid questionnaires as a pre-survey. After verification, the KMO value was 0.851, which exceeded the standard requirement of 0.7, and the significance of Bartlett's sphericity test was 0.00 < 1%, indicating that factor analysis was suitable. The validity test showed that the extraction values of all indicator items were greater than 0.6, and the loading of all factor loadings were greater than 0.65, which met the standard. Environmental responsibility behavior was extracted through exploratory factor analysis using principal component analysis and Kaiser normalization maximum variance extraction method, and two public factors were deleted after rotating the unqualified item "I will take care of the plants and animals in the green area" and "I am willing to donate money for the prevention of natural disasters in green areas". The cumulative variance contribution rate reached 61.141%. After adjusting and modifying the questionnaire based on the pre-survey results, the final questionnaire was formed.

4.2. Data Collection

This study was conducted from June to July 2024, using the online survey platform Wenjuanxing to survey representative cities in Henan Province, including Zhengzhou, Luoyang, Nanyang, Shangqiu, Pingdingshan, Kaifeng, and Luohe. The main survey subjects were urban residents aged 18 and above who were permanent residents of the survey areas. A total of 700 questionnaires were distributed, and 576 were collected and sorted out after the survey, with an effective questionnaire recovery rate of 82.3%.

4.3. Data Analysis

4.3.1. Analysis of Basic Sample Characteristics

In terms of age distribution, the group of 31-40 years old was the main survey group, accounting for 48.26%, while the proportion of survey respondents over 50 years old was the lowest, at only 2.95%. The educational level of survey respondents showed a high degree of concentration, with 40.45% having a bachelor's degree and 4.69% having a master's degree or higher. In terms of income distribution, the income range of 2001-4000 yuan was the main group, accounting for 32.81%, while the proportion of survey respondents with an income of 10,000 yuan or more was relatively low, at only 5.03%. In terms of occupation distribution, full-time workers dominated, accounting for 63.72%, while those who were self-employed accounted for

only 7.47%.

Overall, the 576 survey respondents in this study showed significant differences in terms of gender, age, education level, income, and occupation, providing a diverse sample base.

4.3.2. Descriptive statistical analysis of sample data

The mean values of compliance environmental behavior (CEB) and proactive environmental behavior (PEB) were 3.944 and 3.868 respectively, reflecting that people are more likely to accept environmentally-related behaviors driven by external constraints, while autonomous behaviors are relatively less. The standard deviation was approximately 1.04, indicating that there are certain differences in the behaviors of different respondents, but overall, they are relatively concentrated. The place dependence (mean 3.941) and place identification (mean 3.913) showed similar trends, indicating that respondents showed a high emotional attachment to their place of residence. In environmental knowledge, the mean values of subjective knowledge and objective knowledge were 3.827 and 3.773 respectively, and this difference may be due to people's confidence in their own knowledge, but may be slightly insufficient when faced with specific knowledge tests or facts. The standard deviation of objective knowledge (1.188) was relatively higher, indicating that there are more significant differences in actual knowledge levels among respondents. The mean values of positive emotions and negative emotions were 3.859 and 3.951 respectively, showing that the respondents' emotional experiences had slightly more negative emotions than positive emotions. The standard deviations of the two emotional dimensions were both around 1.04, indicating that most respondents had relatively consistent emotional experiences, although the negative emotions were slightly higher, but the differences were not significant.

5. Descriptive and Inferential Analyses of The Test Results

After collecting survey data through field questionnaires, the research data from 558 effective questionnaires were analyzed using SPSS24.0 and AMOS24.0 for reliability and validity tests, confirmatory factor analysis, model fit goodness-of-fit analysis, and hypothesis testing.

5.1. Reliability and Validity Tests of The Scale, As Well As Confirmatory Factor Analysis

Based on the valid data from the questionnaire, the reliability of the measurement model was tested using SPSS 24.0. The Cronbach's Alpha of the 8 latent variables included in the environmental knowledge, place attachment, based on the valid data from the questionnaire, the reliability of the measurement model was tested using SPSS 24.0. The Cronbach's Alpha values (Cronbach's coefficient) of the 8 latent variables included in the environmental knowledge, place attachment, based on the valid data from the questionnaire, the reliability of the measurement model was tested using SPSS 24.0. The Cronbach's Alpha values (Cronbach's coefficient) of the 8 latent variables included in the environmental knowledge, place attachment, expected emotions, and environmental responsibility behavior scales ranged from 0.887 to 0.944. The overall Cronbach's Alpha for the scale was 0.958, which is greater than 0.7. The KMO value was 0.953, and the significance of Bartlett's sphericity test was 0.00 < 1%. The data were suitable for factor analysis. A confirmatory factor analysis was conducted using AMOS 24.0, as shown in Table 1, with the standardized factor loading values for each item in each latent variable being all greater than 0.65 and all greater than 0.5; the composite reliability (CR) of each latent variable was all greater than 0.8 and all greater than 0.7, indicating that each latent variable has good reliability; and the average variance extracted (AVE) of each latent variable was all greater than 0.6 and all greater than 0.5, indicating that the validity of each latent variable is good, and environmental responsibility behavior scales ranged from 0.887 to 0.944. The overall Cronbach's Alpha for the scale was 0.958, which is greater than 0.7. The KMO value was 0.953, and the significance of Bartlett's sphericity test was 0.00 < 1%. The data were suitable for factor analysis. A confirmatory factor analysis was conducted using AMOS 24.0, as shown in Table 1, with the standardized factor loading values for each item in each latent variable being all greater than 0.65 and all greater than 0.5; the composite reliability (CR) of each latent variable was all greater than 0.8 and all greater than 0.7, indicating that each latent variable has good reliability; and the average variance extracted (AVE) of each latent variable was all greater than 0.6 and all greater than 0.5, indicating that the validity of each latent variable is good., and environmental responsibility behavior scales ranged from 0.887 to 0.944. The overall Cronbach's Alpha value for the scale was 0.958, which is greater than 0.7. The KMO value was 0.953, and the significance of Bartlett's sphericity test was 0.00 < 1%. The data were suitable for factor analysis. A confirmatory factor analysis was conducted using AMOS 24.0, as shown in Table 1, with the standardized factor loading values for each item in each latent variable being all greater than 0.65 and all greater than 0.5; the composite reliability (CR) of each latent variable was all greater than 0.8 and all greater than 0.7, indicating that each latent variable has good reliability; and the average variance extracted (AVE) of each latent variable was all greater than 0.6 and all greater than 0.5, indicating that the validity of each latent variable is good.

Table 1. Reliability Validity and Validation Factor Analysis Results

Variables	Dimensions	Items	Standardized Loading (>0.7)	CR	AVE	Cronbach's Alpha (>0.7)
Urban Residents' Environmental Responsible Behaviours (URERB)	Compliance-based Environmental Behaviour (CBE)	CEB1	0.812	0.893	0.676	0.888
		CEB2	0.818			
		CEB3	0.824			
		CEB4	0.834			
	Proactive Environmental Behaviour (PEB)	PEB1	0.818	0.910	0.669	0.909
		PEB2	0.812			
		PEB3	0.823			
		PEB4	0.813			
		PEB5	0.823			
Place Attachment (PA)	Place Dependence (PD)	PD1	0.801	0.900	0.644	0.900
		PD2	0.799			
		PD3	0.839			
		PD4	0.789			
		PD5	0.782			
	Place Identity (PI)	PI1	0.8	0.909	0.666	0.912
		PI2	0.816			
		PI3	0.818			
		PI4	0.823			
		PI5	0.823			
Anticipated Emotions (AE)	Positive Emotion (EQ)	PE1	0.788	0.887	0.662	0.887
		PE2	0.831			
		PE3	0.815			
		PE4	0.821			
	Negative Emotion (EP)	NE1	0.83	0.889	0.666	0.889
		NE2	0.802			
		NE3	0.812			
		NE4	0.821			
Environmental Knowledge (EK)	Subjective Knowledge (SK)	SK1	0.849	0.930	0.726	0.930
		SK2	0.853			
		SK3	0.851			
		SK4	0.852			
		SK5	0.856			
	Objective Knowledge (OK)	OK1	0.851	0.945	0.740	0.944
		OK2	0.841			
		OK3	0.86			
		OK4	0.866			
		OK5	0.86			
		OK6	0.881			

5.2. Structural Equation Model Fitting and Hypothesis Testing

In AMOS 24.0, maximum likelihood method was used to estimate the parameters of the structural model. The overall fit analysis of the model showed that the relative chi-square value (χ^2/df) was 1.831, the residual mean square of the residuals (RMR) was 0.051, the root mean square of the standardized residuals (RMSEA) was 0.038, and the fit index (CFI) was 0.976, all of which met the standard, indicating that the model fit well.

In this study, the hypothesis path analysis was conducted with a significance level of $P < 0.05$ as the criterion for hypothesis testing. The results of the hypothesis test are shown in Table 1. Hypothesis H3 predicts that the impact of subjective emotions on environmental responsibility behavior is not significant, while the other sub-hypotheses were all statistically significant.

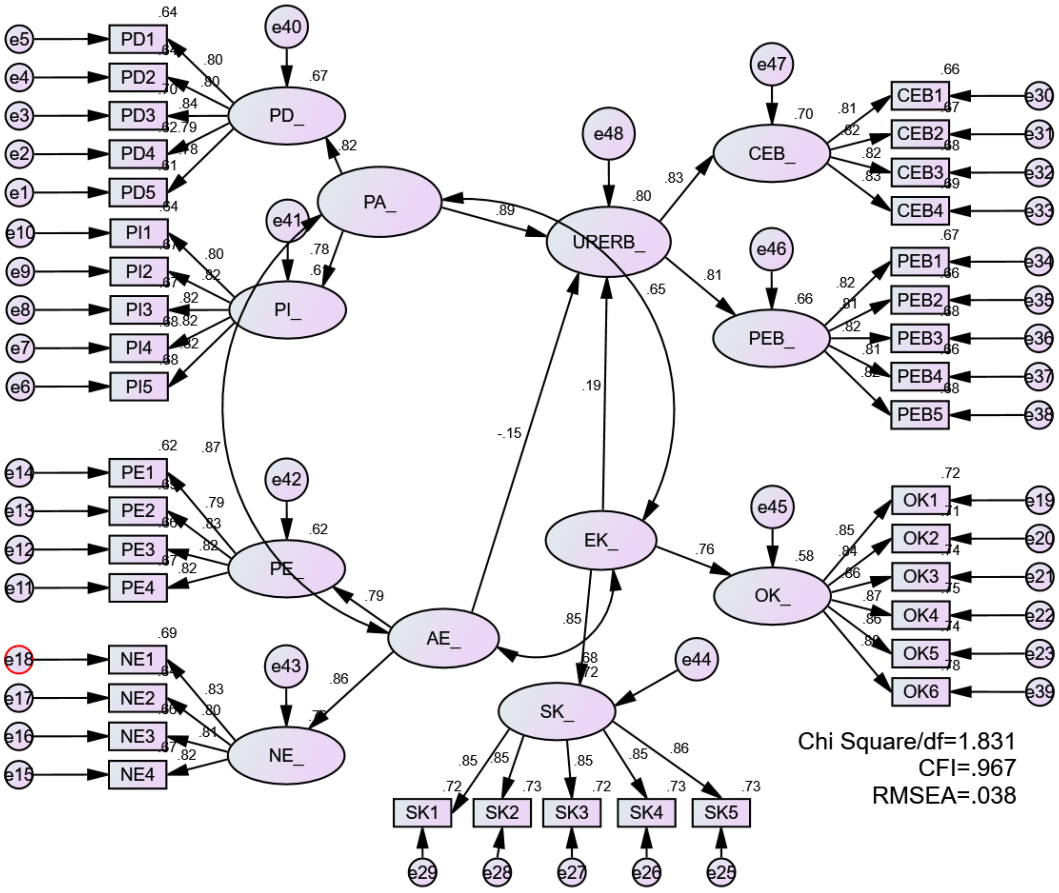

Figure 2. Structural Equation Model

Table 2. Structural Equation Model Fitting and Hypothesis Testing

Structural Equation Model	Estimate	S.E.	T value	P value	Result
H1: URERB<---EK	0.195	0.077	2.451	0.014	Support
H2: URERB<---PA	0.889	-	-	-	Support
H3: ERERB<---AE	-0.151	0.015	-1.614	0.107	Not Support

6. Discussion

The conclusion of this paper confirms and supports the theoretical analysis framework and hypotheses, which has certain reference value for analyzing the influencing factors of urban residents' environmental responsibility behavior.

The empirical results of this study show that the standard path coefficient of environmental knowledge to environmental responsibility behavior is 0.195, with a p-value less than 0.05, proving that the former has a positive and forward impact on the latter. Previous studies have also confirmed this conclusion (Tien et al., 2014; Fu et al., 2019), proving that groups with higher levels of environmental knowledge are more likely to engage in environmental responsibility behavior. There is a strong correlation between place attachment and environmental responsibility behavior, as evidenced by previous studies (Zhang et al. 2020; Xu et al. 2022). This means that individuals who have strong place attachment will promote the occurrence of environmental responsibility behavior. Meanwhile, the anticapated emotions have no significant impact on environmental responsibility behavior, indicating that the emotions of urban residents do not affect their environmental responsibility behavior.

In summary, the research results of this paper can provide certain reference for the sustainable development of urban green spaces and the exploration of the influencing factors of environmental responsibility behavior.

7. Limitations and Future Directions

There are also certain limitations in this paper. The research data type is relatively, mainly cross-sectional data, and later studies can use a combination of longitudinal and cross-sectional data to enhance the reliability and credibility of the research results; This paper did not conduct exploratory factor analysis on the dimensions of each variable, and it is not clear which dimension has a greater impact on environmental responsibility behavior. Future research can deeply explore the mutual influence between different dimensions.

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