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Original Paper

How Does Misperception of Others Affect One's Own Waste Sorting Behavior?—A Study from Chinese Sample

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Abstract

People often misestimate (overestimate or underestimate) the attitudes and behaviors of others in the group, that is, normative misperception (including behavioral misperception and attitudinal misperception) ,which can affect one's own decision-making behavior in turn. This study based on a sample of 1,460 Chinese individuals confirmed that: (1) Overestimated normative misperception positively promoted individuals' own waste sorting behavior, and underestimated normative misperception had no effect on waste sorting. (2) Overestimated behavioral misperception increased individuals' waste sorting behavior, and this effect was mediated by the "impression management motivation-personal norm" chain path. (3) Overestimated attitudinal misperception also increased individual waste sorting behavior, and this effect was mediated by the "impression management motivation-personal norms" and "consequence awareness-personal norms" chain paths.

Keywords

normative misperception, waste sorting, personal norms, impression management motivation, consequence awareness

1. Introduction

Waste sorting is an important way to solve environmental problems of China. In 2019, General Secretary made an important instruction, calling on the whole society to cultivate the good habit of waste sorting and work together to improve the living environment. Since then, China has officially started urban waste sorting and has piloted waste sorting in eight cities, including Beijiang, Guangzhou, Shenzhen, Hangzhou, etc. However, the reality dilemma is that successive waste sorting has been carried out with little effect, and it is difficult for people to take waste sorting into their own actions

(Fan & Xue, 2019; Lin et al., 2023). Thus, how to promote people's waste sorting behavior has become a concern for many research scholars.

Whether individuals will implement waste sorting is influenced by many factors, including external factors: such as social interaction (Zuo et al., 2022), publicity and education (Li Wei et al., 2021), situational factors (Qu & Zhu, 2010) and so on; as well as internal factors: such as cognitive level (Liu et al., 2021), attitudes (Ren & Zhang , 2022), environmental emotions (Li et al.， 2021) and so on. There are also some scholars examined the influence of social norms on waste sorting from the perspective of norm activation theory (e.g., Zhang & Wan, 2021; Han et al. 2016; Xu, 2023). However, it is worth noting that social norms exist at both the individual level and collective level (Rimal & Lapinski, 2015), and there is often an inconsistency between the individual's norms perception and the actual social norm existing in the collective level, that is, normative misperception (Chen et al., 2021), which is often manifested in the misestimation of other's attitudes and behaviors. Normative misperception is easy to occur and can influence a range of behaviors (Prentice & Miller, 1993), such as alcohol use behavior (Kenney et al., 2019), unethical behavior (Halbesleben et al., 2004), cooperative behavior (Yang & Chen, 2022), and so on. Few studies have examined people's waste sorting behavior from the perspective of normative misperception, this paper will analyze waste sorting from the sight of normative misperception to help deeply understand the psychological mechanisms behind waste sorting inaction, and provide a useful supplement to existing theoretical studies. After understanding how normative misperception affect individual's own waste sorting behavior, we can improve residents' waste sorting behaviors by misperception interventions, which in turn contribute to the establishment of a long-term mechanism for urban waste sorting and the construction of sustainable development .

1.1 Normative Misperception and Waste Sorting

Normative misperception is an incorrect and biased perception of norms (Prentice & Miller, 1993; Blanton et al., 2008; Soroa-Koury & Yang, 2010), which means that people often systematically misestimate the prevalence of a behavior or attitude. Normative misperception include behavioral misperception and attitudinal misperception: the former refers to people's misestimation of the degree of prevalence of a given behavior, and the latter refers to people's misestimation of the degree of acceptance or approval of a given behavior by the group (Chen et al., 2021). Based on this, this paper focuses on how misestimation of others' behaviors/attitudes towards waste sorting affects people's own waste sorting behavior.

The question that needs to be answered before exploring the effect of normative misperception on waste sorting is: did normative misperception appear in waste sorting behavior? If it did, how will people misestimate the attitudes and behaviors of others towards waste sorting? Overestimate or underestimate? Prior research suggests that it is possible for people to overestimate the norms that actually exist in groups, for example, Testa et al. (2020) found that college students generally overestimated other people's sexual behavior and approval of sexual behavior, and Amialchuk et al.

(2019) found that people overestimated other people's substance-use behaviors (including alcohol, tobacco, and drug use), which in turn increased the likelihood of engaging in such behaviors. It is also possible for people to underestimate the norms that actually exist in the group, for example, Bursztyn (2020) found that married men in Saudi Arabia underestimated the support of other men for women's labor force participation, Miyajima and Yamaguchi (2017) found that Japanese men underestimated the willingness of the other men in their group to take maternity leave, and this misperception in turn leads to their inability to actively request maternity leave, thus creating a vicious cycle of normative misperception (van Grootel et al., 2018). So this paper proposes the following two different hypotheses:

H1: People generally underestimate others' waste sorting. (underestimated normative misperception)

H1a: People generally underestimate others' waste sorting behavior. (behavioral misperception)

H1b: People generally underestimate others' degree of approval for waste sorting. (attitudinal misperception)

H2: People generally overestimate others' waste sorting. (overestimated normative misperception)

H2a: People generally overestimate others' waste sorting behavior. (behavioral misperception)

H2b: People generally overestimate others' degree of approval for waste sorting. (attitudinal misperception)

The next issue for further consideration is how normative misperception will influence one's own waste sorting behavior. Grimm et al. (2017) noted that perceptions of others' behavior/attitude can influence one's own behavior, because people could justify their moral justification by claiming that their behavior conformed to norms (Schlag et al., 2015). For example, an underestimation of others' pro-social behavior reduced one's own corresponding behaviors (Ganz et al., 2020), whereas overestimation of others' substance use behaviors (including alcohol, tobacco, and drug use) increased the likelihood of engaging in such behaviors (Amialchuk et al., 2019). So this study hypothesizes that normative misperception will have a similar effect on waste sorting behavior. Based on the above reasoning, this paper proposes the following two different hypotheses:

H3: Underestimated normative misperception (both behavioral misperception and attitudinal misperception) will reduce one's waste sorting behavior.

H4: Overestimated normative misperception (both behavioral misperception and attitudinal misperception) will increase one's waste sorting behavior.

1.2 Personal Norms

Personal norms are the individual's conduct standard about the self, which can motivate individuals to develop a moral disposition and a sense of obligation to do what is right (Zhang, 2016). Personal norms can facilitate behavioral implementation not due to social rewards (e.g., praise from others, image enhancement), but the expected post hoc negative experiences (e.g., regret, self-criticism, and guilt) caused by non-compliance with personal norms (Ge & Sheng, 2020). Individual's imagined or actual violations of personal norms leads to guilt, self-denial, and loss of self-esteem, while individual's imagined or actual compliance with personal norms produces pride, increased self-esteem, and a sense

of security. Thus, personal norms can drive waste sorting behavior not for the utilitarian purpose of obtaining extrinsic rewards, but purely due to an intrinsic sense of moral obligation.

Social norms are usually the source of personal norms. Individuals are influenced by shared social rules and norms which shape their expectations of themselves, further form personal norms. When people misjudge the waste sorting behavior of others, their perceived social norms are biased, which leads to a change in personal norms, in turn, changing the implementation of waste sorting behavior. Therefore this paper hypothesizes:

H5: Personal norms mediate the relationship between normative misperception and waste sorting.

1.3 Impression Management Motivation

Impression management theory suggests that people have the desire to maintain a positive image and avoid creating a negative image (Finkelstein & Penner, 2004). Everyone has impression management motives to a greater or lesser extent, the strength of which varies from person to person.In different social scenarios, people portray different images based on the different types of roles they want to play. The stronger the impression management motivation is, the more individuals want to maintain a good image of themselves and are more likely to engage in pro-social behaviors (Grant & Mayer, 2009). As a typical pro-social behavior, waste sorting behavior, can easily be driven by impression management motivation.

Scholars have tried to explain normative misperception from the perspective of impression management (Geiger & Swim, 2016; Chen et al., 2021). The strength of impression management motivation has a close relationship with the strength of social norms perceived by individuals. When individuals misestimate the waste sorting behaviors in a group, the perceived social norms appear in bias, and the impression management motivation will be affected accordingly. When the impression management motivation is strengthened or weakened, the driving force of waste sorting behavior will also change, which in turn affects the waste sorting behavior. Therefore, this paper hypothesizes that impression management motivation also mediates the relationship between normative misperception and waste sorting.

Although impression management motivation seeks social rewards (praise from others, image enhancement) as a reward for performing the behavior, it can still strengthen the individual's internal personal norms, and it sublimates external “utilitarian”motivation into internal “responsibility”. In other words, impression management motivation can influence personal norms, further changing one's own waste sorting behavior. Based on the above analysis, this study proposes:

H6: Impression management motivation and personal norms play the chain mediation roles in the relationship between the normative misperception and waste sorting.

1.4 Consequence Awareness

Consequence awareness generally refers to an individual's awareness of the negative consequences of not performing a certain behavior (Schwartz, 1997). Specifically, the consequence awareness of waste sorting mainly refers to people's perception of the serious negative consequences of failing to waste

sorting, such as land encroachment, destruction of the urban living environment, and the waste of a large amount of resources. When people's perception of the serious consequences of not implementing waste sorting is strong, their likelihood of participating in waste sorting will be the great .

The strength of the consequence awareness is also closely related to the degree of the social pressure faced, when others agree with the implementation of waste sorting, then the negative consequences of non-implementation of the behavior felt by the individuals will be more serious. That is to say, the stronger the perceived social norm is, the stronger the consequence awareness is. When the norm perception is biased, the consequence awareness will also be biased.

According to norm activation theory (Schwartz, 1997), personal norms are also influenced by individual consequence awareness. When individuals are aware of the consequences of not waste sorting, their sense of moral obligation is more likely to be activated, and individuals will experience a strong sense of personal norms and consciously implement waste sorting behaviors. Therefore, this study proposes:

H7: Consequence awareness and personal norms play the chain mediation roles in the relationship between the normative misperception and waste sorting.

The theoretical framework is shown in Figure 1. In order to test the above hypotheses, this paper conducted a survey of 1,460 Chinese residents across the country to explore whether people have normative misperception on waste sorting, and further test whether the existence of normative misperception will affect their own waste sorting behaviors. And the mediation analysis was used to clarify the effect of normative misperception on waste sorting, to help deepen the understanding of the psychological mechanisms behind waste sorting inaction, providing a useful supplement to existing theoretical studies.

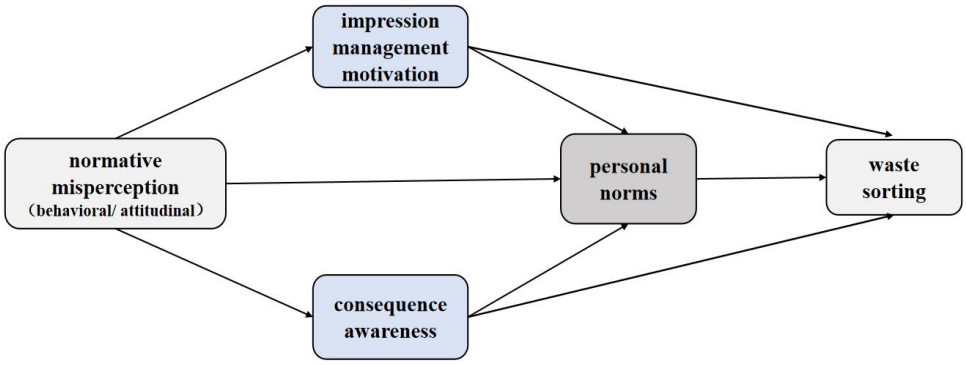

Figure 1. Theoretical Framework

2. Data and Methods

2.1 Subjects

This study distributed questionnaires through the *Credamo* platform, and 1500 Chinese residents participated in the survey. Answers with too long or too short response time were deleted, and 1,460

valid questionnaires were retained, with an effective recovery rate of 97.33%. There were 703 males and 757 females; the age range was 17-59 years old (M=31.95, SD=7.86). As is shown in Table 1.

Table 1. Structure of the Sample

Demographic variables		Frequency	Percentage (%)
Gender	male	703	48.15
	female	757	51.85
Age	< 25	317	21.7
	26-35	806	55.2
	36-45	237	16.2
	46-60	102	7
	> 60	0	0
Education	High school and below	92	6.3
	College	194	13.3
	Undergraduate	840	57.5
	Graduate students and above	333	22.8
Annual family income	< 100,000	171	11.7
	100,000 - 150,000	256	17.5
	150,000 - 200,000	311	21.3
	200,000 - 300,000	285	19.5
	300,000 - 500,000	367	25.1
	500,000 - 1,000,000	66	4.5
	> 1,000,000	4	
Marriage	Single	778	53.3
	Married	682	46.7
Children	Yes	961	65.8
	No	499	34.2
Occupation	Student	187	12.8
	Enterprise personnel	1018	69.7
	Employee	150	10.3
	Civil Servants	48	3.3
	Self-employed	25	1.7
	Freelancers	15	1.0
	Others	17	1.2

2.2 Variables and Measurement

Normative misperception We adopted the same measurement and calculation method as Chen et al. (2021) and Lapinski et al. (2007). 10 items (7-point scale, 1 means completely disagree, 7 means completely agree) measured subjects' **behavioral misperception**, five of the items measured one's own daily waste sorting behavior (self-behavioral items, BM), e.g.,"I usually sort my waste", and five of the items measured the waste sorting behavior of the majority of people in the eyes of the participant (other-behavioral items, BO), e.g., "Most people sort their waste". The mean of the five BM (Cronbach's α = 0.864) represents the BM score, and the mean of the five BO (Cronbach's α = 0.868) represents the BO score. The other 10 items (7-point scale, 1 means completely disagree, 7 means completely agree) measured subjects' and **attitudinal misperception,** five of the items measured their own attitudes toward waste sorting behavior (self-attitude items, AM), e.g., "I support waste sorting ", and five of the items measured the attitudes of the majority toward waste sorting as perceived by the subjects (other-attitude items, AO), e.g., "Most people support waste sorting". The mean score of the 5 AM (Cronbach's α = 0.833) represents the AM score, and the mean score of the 5 AO (Cronbach's α = 0.815) represents the AO score. According to Duong and Parker (2018) and Chen et al. (2021), the mean of BM and AM scores of all subjects (M_{BM} and M_{AM}) can be regarded as the social norms actually present in the group, while the BO and AO scores of each subject represent the subject's perception of the social norms at the individual level, and the difference between them represents the normative misperception. That is, **behavioral misperception = BO - M_{BM}, attitudinal misperception = AO - M_{AM}.**

Waste sorting A self-reported frequency scale was used to measure subject's waste sorting behavior. Subjects were asked to answer the question "How often have you sorted your waste in the last six months?"The frequency of waste sorting range from 1 to 7, higher value indicated the higher frequency of waste sorting.

Personal norms Referring to Stern's (1999) study, personal norms were expressed in 3 items, such as "I think it is my responsibility to sort waste," scored on a 7-point scale, with 1 indicating total disagreement and 7 indicating total agreement, and Cronbach's α = 0.903.

Impression management motivation Adapted from the *Workplace Impression Management Motivation Scale* developed by Duan et al. (2019), 3 items (Cronbach's α = 0.871) were used to measure impression management motivation, such as "If I carry out waste sorting, other people will have a better impression of me", scored on a 7-point scale, with 1 representing total disagreement, 7 representing total agreement.

Consequence awareness Referring to Stern's (1999), 3 items (Cronbach's 's α = 0.884) were used to measure consequence awareness, such as "Failure to waste sorting will curb ecological sustainability", scored on a 7-point scale, with 1 representing complete disagreement, 7 representing complete agreement.

Table 2. Variable Measurement Items

Variables	Measurement items
Behavioral misperception	I/most people sort their waste.
	I/most people put out their waste according to the signs on the garbage cans.
	I/most people sort recyclables such as empty plastic bottles.
	I/most people sort hazardous waste such as batteries.
	I/most people sort food waste.
Attitudinal misperception	I/most people support sorting waste.
	I/most people support putting out waste according to the symbols in the garbage cans.
	I/most people support sorting recyclables such as empty plastic bottles.
	I/most people support sorting hazardous waste such as batteries.
	I/most people support sorting food waste.
Personal norms	I think I should sort waste.
	I think I have a responsibility to sort waste.
	I feel guilty if I don't sort my waste.
Consequence awareness	Failure to sort waste will lead to waste of resources.
	Failure to sort waste will lead to environmental degradation.
	Failure to sort waste will curb ecologically sustainable development.
Impression management motivation	People will have a better impression of me if I implement waste sorting.
	If I implement waste sorting, others will have a more positive and favorable opinion of me.
	If I sort waste, people will feel good about me.
Label variable	Waste sorting is a green behavior.
	Waste sorting can damage the environment.
	Waste sorting can pollute the air.
Waste sorting	How often did you sort waste in the last six months?

Label variable According to Chen et al. (2021) and Visschers et al. (2016), we set the variable "knowledge of waste sorting" as the label variable, which is not correlated with the above variables. This label variable was measured with three items (Cronbach's $\alpha = 0.855$), such as "Waste sorting is a

green behavior," all of which were scored on a 7-point scale. In order to ensure the sensitivity of the test for common method bias, the label variable was presented and scored in the same way as the other variables. All the items, including the label variable, were placed out of order during the measurement.

Control variables Control variables included demographic variables such as age, occupation, education, gender, income, marriage status, and whether or not had children.

2.3 Results

2.3.1 Common Method Bias Test

The latent variables involved in this study include: normative misperception (attitudinal misperception and behavioral misperception), personal norms, impression management motivation, and consequence awareness. Firstly, the common method bias test was conducted, and the results of Harman's one-way test showed that there were 8 factors with unrotated eigenroots greater than 1, and the variance of the first unrotated factor was 20.08%, which was much lower than the critical criterion of 40%. Due to the problem of insensitivity of Harman's one-factor method to the variation of CMV and CMB (Tang &Wen, 2020), this study also used the labeled variable method (CFA marker technique) to conduct the test, and there was no significant difference between the baseline model and models C and U (*ps* > 0.05), which can be regarded as the no or little common method bias. The overall KMO (Kaiser-Meyer-Olkin) value of the questionnaire was 0.902 and the Barett's test of sphericity chi-square value was 16104.47, $p < 0.001$, which is statistically significant. Confirmed factor analysis was conducted using AMOS 24, and the model fit index was good [x^2/df =1.781, RMSEA= 0.027, CFI =0.993, NNFI=0.961], the standardized loadings of the factors for all the items were higher than 0.5, the cronbach's α of the questionnaire's subscales were greater than 0.8, indicating the questionnaire had a higher reliability. The combined reliability (CR) were all greater than 0.8, the average variance extracted (AVE) were all greater than 0.6, and the questionnaire had good convergent validity. See Table 3 for details.

2.3.2 Analysis of Results

Overestimation or underestimation?

According to the formula of normative misperception: behavioral misperception = BO -M_{BM}, attitudinal misperception = AO -M_{AM}. when behavioral/attitudinal misperception > 0, it means that the normative perception of an individual is higher than the actual norm, i.e., there is an overestimated normative misperception; when behavioral/attitudinal misperception < 0, it means that the normative perception of an individual is lower than the actual norm, i.e., there is an underestimated normative misperception. The calculation results of normative misperception are shown in Table 4 below.

In terms of waste sorting behavior, 675 (46.23%) overestimated others' waste sorting behavior and 785 (53.77%) underestimated others' waste sorting behavior, and the behavioral misperception in the overestimation group ($M_{overestimation}$ = 0.32, *SD* = 0.25) was significantly higher than those in the underestimation group ($M_{underestimation}$ = -1.36, *SD* = 1.16), t = -22.125, $p < 0.001$, 95% CI = [-1.83, -1.53].

Table 3. Results of the Reliability Test

latent variable	Observed variables	Standardized loading	Cronbach's α	CR	AVE
Self-behavioral items（BM）	BM_1	0.818	0.864	0.910	0.671
	BM_2	0.791			
	BM_3	0.833			
	BM_4	0.862			
	BM_5	0.788			
Other-behavioral items（BO）	BO_1	0.823	0.868	0.913	0.677
	BO_2	0.801			
	BO_3	0.842			
	BO_4	0.855			
	BO_5	0.791			
Self-attitudinal items（AM）	AM_1	0.746	0.833	0.893	0.625
	AM_2	0.811			
	AM_3	0.783			
	AM_4	0.835			
	AM_5	0.775			
Other-attitudinal items（AO）	AO_1	0.774	0.815	0.899	0.640
	AO_2	0.817			
	AO_3	0.802			
	AO_4	0.826			
	AO_5	0.780			
Personal norms（SN）	SN_1	0.915	0.903	0.921	0.795
	SN_2	0.872			
	SN_3	0.887			
Impression management motivation（IM）	IM_1	0.834	0.871	0.869	0.689
	IM_2	0.789			
	IM_3	0.866			
Consequence awareness（CC）	CC_1	0.844	0.884	0.905	0.761
	CC_2	0.879			
	CC_3	0.893			
Label variable（SG）	SG_1	0.815	0.855	0.868	0.687
	SG_2	0.827			
	SG_3	0.844			

In terms of attitudes toward waste sorting, 718 (49.18%) overestimated others' approval attitudes toward waste sorting and 742 (50.82%) underestimated others' approval attitudes toward waste sorting, and the attitude misperception was significantly higher in the overestimation group ($M_{overestimation}$ = 0.31, SD = 0.23) than in the underestimation group ($M_{underestimation}$ = -1.26, SD = 1.26), t = -21.144, p < 0.001, 95% CI = [-1.72, -1.42].

Table 4. Calculated Results of Normative Misperception

	behavioral misperception		**attitudinal misperception**	
	Overestimation （＞0 ）	Underestimation （＜0 ）	Overestimation （＞0 ）	Underestimation （＜0 ）
Frequency	675	785	718	742
Mean value	0.32	-1.36	0.31	-1.26

The above analysis indicates that there are both overestimated and underestimated normative misperception in the population. Now we need to further clarify how the overestimated misperception and underestimated misperception will affect one's own waste sorting behavior.

The effect of normative misperception on waste sorting

This paper will explore how overestimated misperception (attitudinal/behavioral) and underestimated misperception (attitudinal/behavioral) affect waste sorting behavior respectively.

Behavioral overestimation group The main effect of behavioral misperception on waste sorting was tested by hierarchical regression with waste sorting as the dependent variable, behavioral misperception as the independent variable, and demographic variables as the control variables. The results showed that none of the seven control variables had a significant effect on waste sorting (ps > 0.05), and there was a significant main effect of behavioral misperception on waste sorting , β = 0.29, p < 0.05, t = 4.49, 95% CI = [0.42, 1.08], suggesting that the more one overestimated the waste sorting behavior of others, the more one's own waste sorting frequency showed.

To further reveal the mechanism of the influence of behavioral misperception on waste sorting, we used Model 80 in Preacher and Hayes' (2004) PROCESS 3.2 (Bootstrap N = 5000) to test the chain mediating roles of impression management motivation, consequences awareness, and personal norms, with all demographic variables as control variables. The results showed a significant main effect of behavioral misperception on waste sorting, effect = 0.74, p < 0.001, t = 4.58, 95% CI = [0.00, 0.42], suggesting that overestimated behavioral misperception do influence one's own waste sorting behavior. The results of the chain mediation effect analysis were shown in Table 5: among the five indirect paths, the paths of “behavioral misperception→personal norms→waste sorting” and “behavioral misperception→impression management motivation→personal norms→waste sorting” were both significant (confidence intervals did not include 0), indicating that the mediating role of personal norms

was valid, and the chain mediation role of "impression management motivation→personal norms" was also valid. However, the path of "behavioral misperception→consequence awareness→personal norms→waste sorting" was not significant (the confidence interval contains 0). In other words, the main mechanism by which behavioral misperception increase waste sorting was through activating impression management motivation, then strengthening personal norms, and finally achieving the result of enhancing one's own waste sorting. The direct effect of behavioral misperception on waste sorting was still significant, which indicated that impression management and personal norms partially mediate the effect of behavioral misperception on waste sorting , as shown in Figure 2.

Table 5. Bootstrap Analysis of the Chain Mediation Effect in the Behavioral Overestimation Group

Indirect path	effect	se	LLCI	ULCI
behavioral misperception→impression management motivation→waste sorting	0.001	0.06	-0.12	0.12
behavioral misperception→consequence awareness →waste sorting	0.01	0.03	-0.05	0.09
behavioral misperception→personal norms →waste sorting	**0.20**	**0.09**	**0.04**	**0.40**
behavioral misperception→impression management motivation→personal norms→waste sorting	**0.03**	**0.02**	**0.004**	**0.08**
behavioral misperception→consequence awareness →personal norms→waste sorting	0.01	0.01	-0.002	0.03
Direct path				
behavioral misperception→waste sorting	**0.48**	**0.17**	**0.01**	**0.14**

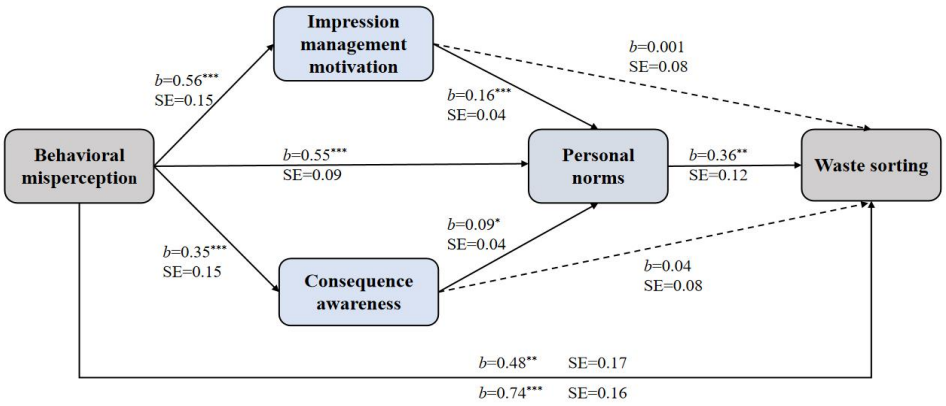

Figure 2. Chain Mediation Model for the Behavioral Overestimation Group (N=675)

*Note. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.*

Attitudinal overestimation group The main effect of attitude misperception on waste sorting was tested by hierarchical regression with waste sorting as the dependent variable, attitudinal misperception as the independent variable, and demographic variables as the control variables. The results showed that none of the seven control variables had a significant effect on garbage classification (*ps* > 0.05), and that there was a significant main effect of attitudinal misperception on waste sorting, $\beta = 0.16$, $p < 0.05$, $t = 2.41$, 95% CI = [0.09, 0.91], suggesting that the more one overestimates others' attitudes toward waste sorting, the more one's waste sorting frequency showed.

Table 6. Bootstrap Analysis of the Chain Mediation Effect in the Attitudinal Overestimation Group

Indirect path	effect	se	LLCI	ULCI
attitudinal misperception→impression management motivation→waste sorting	0.03	0.05	-0.06	0.15
attitudinal misperception→consequence awareness →waste sorting	0.02	0.04	-0.05	0.10
attitudinal misperception→personal norms →waste sorting	**0.20**	**0.08**	**0.06**	**0.37**
attitudinal misperception→impression management motivation→personal norms→waste sorting	**0.06**	**0.03**	**0.01**	**0.14**
attitudinal misperception→consequence awareness →personal norms→waste sorting	**0.03**	**0.02**	**0.003**	**0.07**
Direct path				
attitudinal misperception→waste sorting	0.09	0.19	-0.65	0.29

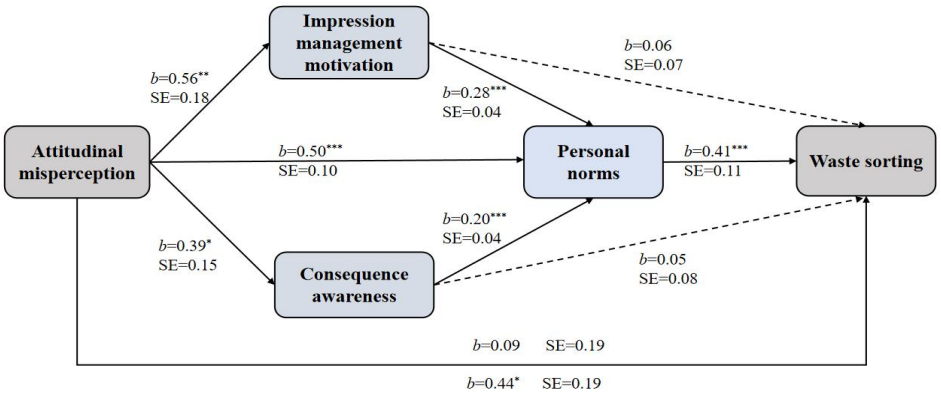

Figure 3. Chain Mediation Model for the Attitudinal Overestimation Group (N=718)

*Note. *** p < 0.001, ** p < 0.01, * p < 0.05.*

To further reveal the mechanism by which attitudinal misperception influence waste sorting, we also used model 80 in Preacher and Hayes' (2004) PROCESS 3.2 (Bootstrap N = 5000) to test the chain mediation roles of impression management, consequence awareness, and personal norms, with all demographic variables as control variables. The results showed a significant main effect of attitudinal misperception on waste sorting, effect = 0.44, $p < 0.05$, $t = 2.32$, 95% CI = [0.07, 0.81], suggesting that overestimated attitudinal misperception do influence one's own waste sorting behavior. The results of the chain mediation effects analysis were shown in Table 6: Among the five indirect paths, “attitudinal misperception → personal norms → waste sorting ” and “attitudinal misperception → impression management → personal norms → waste sorting ” “attitudinal misperception → consequence awareness→personal norms→waste sorting” were all significant (confidence intervals do not include 0), indicating that the mediating role of personal norms was established, and the chain mediation roles of “impression management motivation→personal norms” and “consequence awareness→personal norms” were also significant. The direct effect of attitudinal misperception on waste sorting was not significant, indicating that “impression management motivation→personal norms” and “consequence awareness→personal norms” played a fully mediating role in the effect of attitudinal misperception on waste sorting . The variable relationship diagram was shown in Figure 3.

Behavioral underestimation group The main effect of behavioral misperception on waste sorting was tested by hierarchical regression with waste sorting as the dependent variable, behavioral misperception as the independent variable, and demographic variables as the control variables, and the results showed that none of the seven control variables had a significant effect on garbage classification ($ps > 0.05$), the main effect of behavioral misperception on waste sorting was not significant, $\beta = -0.04$, $p = 0.49$, $t = -0.70$, 95% CI = [-0.11, 0.05], suggesting that underestimated behavioral misperception did not have a significant effect on one's own waste sorting behavior.

Attitudinal underestimation group The main effect of attitudinal misperception on waste sorting was tested by hierarchical regression with waste sorting as the dependent variable, attitudinal misperception as the independent variable, and demographic variables as the control variables, and the results showed that none of the seven control variables had a significant effect on waste sorting ($ps > 0.05$), and that the main effect of attitudinal misperception on waste sorting was not significant , $\beta = -0.13$, $p = 0.10$, $t = -1.63$, 95% CI = [-0.03, 0.003], suggesting that underestimated attitudinal misperception did not have a significant effect on one's own waste sorting behavior.

2.3.3 Conclusion

The above results showed that overestimated normative misperception positively promoted individuals' own waste sorting behavior, and underestimated normative misperception had no effect on waste sorting. In particular, overestimation of behavioral misperception increased individuals' waste sorting behavior, the effect of which was mediated by the chain path “impression management motivation-personal norms”. And overestimation of attitudinal misperception also increased

individuals' waste sorting behavior, the effect of which was mediated by the chain paths “impression management motivation-personal norms” and “consequence awareness-personal norms”.

3. Discussion

3.1 Attitudinal Misperception vs Behavioral Misperception

In the overestimated situation, the attitudinal misperception could activate both the individual's impression management motivation and the consequences awareness, which in turn strengthened the personal norms and achieved the result of enhancing waste sorting behavior. While the behavioral misperception strengthened the personal norms by only activating the impression management motivation, which in turn facilitated the waste sorting. This can be explained by norm-focused theory (Cialdini et al, 1991): behavioral and attitudinal misperception respectively corresponded to people's overestimation of descriptive and imperative norms , which pointed to different motives. The former one associated with internal individual motivation and the latter one involving both interpersonal/external and internal individual motivation. Impression management motivation was more about self-interest, so it was more inclined to be an internal motivation. Consequence awareness was more concerned about the impact on the outside world, so it was more inclined to be an external motive. Therefore, attitudinal misperception can activate both impression management motivation (internal) and consequence awareness (external), while behavioral misperception can only activate impression management motivation (internal).

3.2 Significance of the Study

Solving the problem of waste sorting inaction is of great significance in accelerating the establishment of sustainable development society. Based on the perspective of normative misperception, this paper investigated the data of 1460 residents across China and revealed the behavioral mechanism of residents' waste sorting. The study showed that misestimation of social norms in the group significantly affected their own waste sorting behavior. By comparing the waste sorting behaviors of the overestimated and underestimated groups, we found that waste sorting was significantly stronger in the behavioral overestimation group than in the behavioral underestimation group ($M_{\text{overestimation}}$ = 6.33, $M_{\text{underestimation}}$ = 5.72, $p < 0.001$, t = -9.25, 95% CI = [-0.74, -0.48]), and that waste sorting in the attitudinal overestimation group was significantly stronger in the attitudinal underestimation group ($M_{\text{overestimation}}$ = 6.22, $M_{\text{underestimation}}$ = 5.71, $p < 0.001$, t = -7.81, 95% CI = [-0.65, -0.39]), implying that increasing residents' normative perceptions had a significant contributing effect on waste sorting behavior. This provided some implications for enhancing residents' waste sorting in practice. Normative cues can be used to increase residents' waste sorting behaviors by improving normative perceptions and changing normative misperception. Theoretically, this study compared the different influence mechanisms of two different normative misperception on waste sorting in the overestimated and underestimated situations, which provides new perspectives for waste sorting research and useful complementary to existing theories.

3.3 Limitation and Future Perspectives

This study focuses on how normative misperception in different directions (overestimation vs. underestimation) affect residents' waste sorting behavior, and some meaningful results were obtained, but it is worthwhile to explore whether there are other more convincing explanatory variables for the process mechanism of normative misperception on waste sorting . Although this study confirmed the chain mediation role of “impression management motivation-personal norms” and “consequences awareness-personal norms”, it is only through the test of the mediation model in the PROCESS, and the mediating effect can be further confirmed by manipulating the mediators, which will be more convincing. It can be improved in the subsequent research. In addition, although the findings of this study are inspirational and informative for practice, how to improve residents' normative perceptions to enhance waste sorting behaviors in the real world needs to continue to be demonstrated. Even though previous studies have shown that normative information cues have a better effect on misperception intervention, how to apply them in real life still needs to be answered in future studies.

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