




## Article

# Perceived Behavioral Control as a Mediator between Attitudes and Intentions toward Marine Responsible Environmental Behavior

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**Abstract:** The marine environment has plunged into crisis with the growth of human activities. The enhancement of responsible environmental behavior (REB) requires policy and education to cultivate social awareness and actions to sustain marine resources. Several studies revealed that the intention serves as an effective predictor of actual behaviors. Furthermore, researchers generally acknowledge that attitudes and perceived behavioral control are potential factors toward behavior intention. However, some research has found that a positive attitude toward the environment does not translate into responsible environmental behavior. Additionally, the model of behavior in the marine context, especially the relationships between attitudes, perceived behavioral control, and the intention of responsible environmental behavior, are still not clear. Students' attitudes, perceived behavioral control, and intentions toward responsible marine environmental behavior (M-REB) were evaluated via questionnaires. The data from a total of 79 undergraduate students were analyzed. The results suggest that perceived behavioral control is the mediator between attitudes and intentions toward M-REB. This finding reveals the potential benefits of reconsidering the importance of perceived behavioral control in promoting M-REB and provides empirical evidence for future policy-makers in society and education.

**Keywords:** attitude; perceived behavioral control; marine responsible environmental behavior; mediation effect



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## 1. Introduction

Recently, a rapid decline in marine resources due to habitat destruction, overfishing, and pollution has become a trial for both the marine environment and human beings [1,2]. There is a need to build responsible marine environmental behavior (M-REB) to sustain the marine environment through the educational and policy-making processes [3,4]. Ocean literacy has multiple aspects or principles and fundamental concepts [5]. M-REB, such as collective actions, has been regarded as the core aim of ocean literacy [6]. M-REB and active citizens' development have become the ultimate environmental education goal [7,8].

Both M-REB and REB pursue a similar goal and comprise same psychological components and behavior categories. However, marine issues usually involve dynamic mechanisms and complex/systematic knowledge. For instance, the marine issue is inextricably interconnected with Earth materials and natural phenomena, and thus is constantly changing. Moreover, most human activities are not directly marine-based [9]. For example, only about 40% of the world's population lives in coastal areas [10,11]. People usually do not understand that their everyday actions can impact the ocean. Stern et al. noted that

experience in nature as a child is an important factor for their concern for the environment as an adult [12]. Due to the dissimilarity of environmental experiences between the marine and general environment, people's perceptions toward the marine environment might be slightly different from the general environment. Moreover, the relative contributions of the psychological components to REB or M-REB may be different. With this in mind, the promotion of citizens' M-REB requires more relevant studies to clarify its mechanism.

Several attempts have been made to construct a model of M-REB. Researchers generally acknowledge that one's attitude is a potential REB factor [4,13–15]. However, a growing body of literature suggests a positive attitude does not translate into actual behaviors. Ajzen and Fishbein [16] and Cottrell [15] indicated that the early studies on attitudes as an explanatory factor for a change in human behaviors revealed that a strong relationship between attitudes and overt behaviors had not been supported. In recent years, Chen and Tsai [17] investigated marine environmental awareness among university students in Taiwan. They found that students possess attitudes toward the marine environment but do not actively engage in environmental actions. According to Heberlein and Black [18], and Ajzen [19], predicting human behaviors is hardly accurate through a single facet such as attitudes due to human complexity. Cottrell [15] also noted that research efforts now are apt to focus more on when attitudes predict behaviors rather than whether attitudes predict behaviors. To discover a possible mechanism for attitudes, we reviewed a series of studies on behaviors. Baron and Kenny [20] pointed out the mediator can explain how the independent focal variable can influence the dependent variable through a third variable. In this regard, we hypothesize that the relatively low correlation between attitudes and REB might be due to a mediation effect. To find the possible mediator variable, human social behaviors such as M-REB are partially under volitional control. Thus, perceived behavioral control (PBC) becomes a crucial antecedent [21,22]. The PBC variable can influence behavior implicitly through the mediation of behavioral intention and directly [19,23]. Numerous studies exploring behavioral models in varied contexts suggest that both attitudes and PBC relate to behavioral intentions [7,14,24,25].

Moreover, some evidence reveals that the relationship between attitudinal factors and intentions might be inconclusive as we exclude the contribution of PBC. Surveys such as that conducted by Desombre, et al. [26] showed that general teachers' low sense of efficacy could act as a mediator and exhibit less favorable attitudes toward inclusive education than special teachers. Paul et al. [22] examined the effects of environmental concern and PBC on purchase intention in the environmental context. The results suggested that environmental concern can influence purchase intention via an indirect effect through PBC.

To date, there is still much uncertainty about the relationship between attitudes and intentions toward M-REB. Based on previous studies, it seems reasonable to argue that a positive attitude does not translate into actual behaviors due to the indirect effect of PBC on the relationship between attitudes and M-REB. If we can understand this mechanism, implementing policies and educational instructions will be facilitated and foster citizens' REB. Therefore, the present study aims to address this issue by investigating the relationship between attitudes, PBC, and M-REB through path analysis. The research contained in this paper sought to answer: Can PBC serve as a mediator between M-REB attitudes and intentions in the marine context?

## 2. Materials and Methods

### 2.1. Subjects

In total, 79 undergraduate students who enrolled for a general education course in a national university were recruited in this study. All the participants are Han Chinese people. In Taiwan, senior high school students who wish to pursue their studies at the tertiary level, must take the annual national competitive entrance examination. The university is a comprehensive university with an above-average entrance examination score. Participants in the current study come from a variety of departments. The characteristics of samples are presented in Table 1. Participants were asked to fill out an informed consent stating that

they were volunteers and could end the questionnaire at any time. The consent contains the participant's name and phone number in case there were any future questions. After finishing the informed consent, each participant was asked to complete three questionnaires that includes items to assess three variables (intentions, attitudes, and PBC). All participants received a gift certificate (NTD 200, equal to USD 7.5) as compensation. A 5-point Likert-type scale was adopted to quantify these variables (1 = strongly disagree, 5 = strongly agree).

**Table 1.** The characteristics of samples.

Variable	Categories	Student Count
Gender	Male	33 (42%)
	Female	46 (58%)
College year	2nd	17 (21%)
	3rd	40 (51%)
	4th	22 (28%)
Background	Natural sciences	42 (53%)
	Social sciences	37 (47%)

## 2.2. Instruments

### 2.2.1. Intentions toward Responsible Marine Environmental Behavior (M-REB, Intentions Instrument)

M-REB refers to the actions aimed at improving ocean environmental quality. REB contains a wide range of learned actions identified in five categories by Sia, Hungerford and Tomera [4], Hungerford and Peyton [27]: ecomanagement, consumerism, persuasion, legal actions, and political actions. The definition of this categorization is described in Table 2. However, our questionnaire excluded political actions due to fewer opportunities for undergraduate students to attend political actions. Eight items assess intentions toward M-REB (e.g., "I am willing to support marine laws against marine environmental disruptions"; "I am willing to take public transportation to reduce carbon emissions").

**Table 2.** The category of responsible environmental behavior.

Types	Definition
Ecomanagement	Any physical action taken by an individual aimed directly at maintaining or improving the existing ecosystems.
Consumerism	An economic threat by an individual aimed at some form of behavioral modification.
Persuasion	An effort to verbally motivate people to take positive environmental actions.
Legal action	Any action taken by an individual aimed at some aspect of environmental law enforcement.

### 2.2.2. Attitudes toward M-REB (Attitudes Intention)

Attitudes toward behavior refer to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question [19]. According to Eagly and Chaiken [28], attitudes are believed to be a function that represents one's perceived consequence and outcome evaluation. An individual tends to possess a favorable attitude while the outcome evaluation is positive, and thereby he/she is more likely to engage in the specific behavior [7,19]. To enhance the validity of prediction on one's behavior, Norman [29] suggests that the assessments of two attitudinal components (cognitive and affective) should be considered. The affective component refers to an individual's general positive/negative feeling toward a certain issue. The cognitive component consists of the individual's belief in the importance of a certain issue. Based on previous studies, the items were designed to measure attitudes through three observed variables, which are interest (whether the specific behavior is interest), favor (whether the specific behavior is positive), and value (whether the specific behavior is important). Twenty-four items assess REB attitudes in the marine environmental context (e.g., "For me, participating

beach clean-up is interesting/positive/important”; “For me, bringing my shopping bag is interesting/positive/important”).

### 2.2.3. Perceived Behavioral Control toward M-REB (Perceived Behavioral Control (PBC) Instrument)

PBC refers to people’s perception of the ease or difficulty of performing the behavior of interest [19]. Concerning the perceived ability to perform a behavior, a similar term “self-efficacy” proposed by Bandura, et al. [30] is included in the present study. According to Van Dintner, et al. [31], Bandura [32], self-efficacy helps individuals decide how much effort they will spend on a task and how long they will persist when experiencing difficulties and how resilient they will appear in detrimental situations. Hines, Hungerford and Tomera [7] has noted that the perception of how well one can control factors in the behavioral context may facilitate or constrain the specific action. Moreover, Hines’s team reviewed a number of studies on intentions and self-confidence. These studies suggest that one’s intentions will be lower as an individual holds little control over a certain behavior, even if he/she demonstrates a positive attitude. The finding is similar to our argument that PBC plays a more vital role in the prediction of intentions than attitudes. 8 items assess PBC toward REB in the marine environmental context (e.g., “It is easy for me to persuade others into bringing their shopping bag”; “It is easy for me to avoid buying microbead-containing products”).

### 2.3. Analysis

Data were analyzed by IBM® SPSS version 23. To examine whether PBC plays a mediator between attitudes and intentions, the regression model provided by Baron and Kenny [20] and a statistical technique named the Sobel test proposed by MacKinnon and Dwyer [33] were used. According to this framework, the regression analyses through three paths are prerequisites for Sobel test. First, attitudes require to be significantly related to intentions and PBC, respectively. Second, PBC needs to be significantly related to intentions. Third, the relationship between attitudes and intention should be declined as we take PBC into consideration. The Sobel test [34] is conducted to determine the relationships of the study because it is a commonly used instrument for testing whether a mediator variable significantly carries the influence of an independent variable to a dependent variable. By conducting the multivariate method, Sobel test can indicate which model components require to be strengthened. In other words, the Sobel test can provide a statistical index for the researcher to compare the degree of direct and indirect effects. Finally, previous studies have shown that demographic factors are important predictors of REB. Thus, the influences of sex, years in school, learning background (natural sciences or social sciences) on M-REB, attitudes, and PBC will also be measured.

## 3. Results

First, the results of descriptive statistics for all the constructs are shown in Table 3. The internal consistency/reliability of items were established with Cronbach’s  $\alpha$  (intention items = 0.86; attitude items = 0.95; PBC items = 0.76).

**Table 3.** Descriptive statistics for items.

Instruments	Mean (SD)
Intentions Instrument	3.87 (0.66)
Attitudes Instrument	4.08 (0.62)
Perceived Behavioral Control Instrument	3.89 (0.57)

Second, through the correlation analysis, attitudes and PBC are positively correlated to intentions (Table 4), with Pearson coefficient (attitudes = 0.39, PBC = 0.41). Additionally, all the demographic factors (gender, college year, and background) are not significant to M-REB (Table 4; Table 5). Only individuals’ college year is positively correlated to their attitudes (0.23) and PBC (0.23).

**Table 4.** Correlation of variables.

	College Year	M-REB	Attitudes	PBC
College year	-			
M-REB	0.08	-		
Attitudes	0.23 *	0.39 **	-	
PBC	0.23 *	0.41 **	0.59 **	-

\* =  $p < 0.05$ ; \*\* =  $p < 0.01$ . M-REB: Marine responsible environmental behavior intentions. PBC: Perceived behavioral control.

**Table 5.** T-test of the demographic factors (*t*-value).

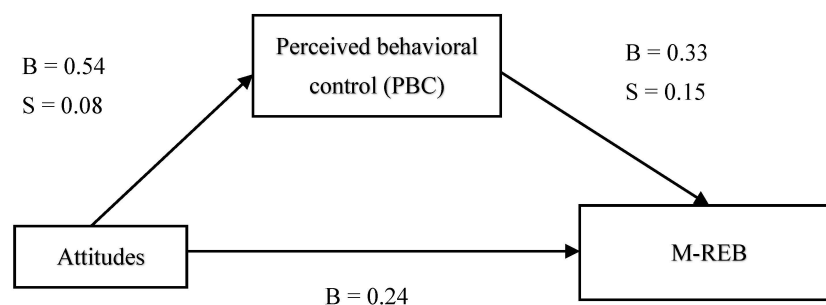
	Mean (SD)		<i>t</i>
	Gender		
	Male	Female	
M-REB	3.75 (0.51)	3.96 (0.75)	1.45
Attitudes	3.94 (0.64)	4.18 (0.59)	1.77
PBC	3.76 (0.64)	3.98 (0.50)	1.70
	Background		
	Natural Sciences	Social Sciences	
	M-REB	3.86 (0.70)	
Attitudes	4.03 (0.76)	4.12 (0.49)	0.60
PBC	3.87 (0.60)	3.90 (0.54)	0.38

Third, we tested the mediation effect through the Sobel test. The hypothesis test based on regression results is shown in Table 6. This test suggests that the direct effect of attitudes on intentions is significant with the unstandardized regression coefficient = 0.42. However, when we consider PBC as a mediator, this direct effect becomes non-significant. In other words, the relationship between attitudes and intention is declined as we consider PBC. Meanwhile, The results Sobel test (Figure 1) suggest that the significant mediation effect of PBC on the relationship between attitudes and intentions is supported ( $z = 2.09$ ,  $s = 0.09$ , indirect effect = 0.18).

**Table 6.** Hypothesis test based on regression results.

Variables	B	Std. Error	<i>t</i>	Sig.
Att→M-REB	0.42	0.11	3.68	<0.001
Att→PBC	0.54	0.08	6.47	<0.001
PBC→M-REB (considering Att)	0.33	0.15	2.19	0.03
Att→M-REB (considering PBC)	0.24	0.14	1.73	0.09

Att: Attitudes. M-REB: Marine responsible environmental behavior intentions. PBC: Perceived behavioral control.



**Figure 1.** The mediation effect of perceived behavioral control in marine environmental attitude-behavior correspondence.

## 4. Discussion

### 4.1. General Discussion

The present study was conducted to investigate the relationship between attitudes, PBC, M-REB intentions, and demographic factors in the marine environmental context. In addition, we completed a mediation test to determine whether attitudes influence intentions via an indirect effect of PBC. The results of descriptive statistics reflect the relative high level of participants' intention (Mean = 3.87), attitudes (Mean = 4.08), and PBC (Mean = 3.89). Meanwhile, we found a significant correlation between attitudes, PBC, and intentions. These results are consistent with previous studies of REB [14,24,25]. However, demographic factors such as gender, grade, and learning background are not significantly related to M-REB. This finding is consistent with a postal survey of pro-environmental behavior conducted by Whitmarsh and O'Neill [35].

One of the main endeavors within environmental education is to clarify the mechanism between attitudes and behaviors. This concern is aligned with our initial purpose to explore when attitudes predict behaviors reliably; the Sobel test (mediation test) was adopted to address this issue. The mediation test results show that PBC plays a significant mediator between attitudes and intentions toward REB in the marine environmental context. According to Frazier, et al. [36], a mediator can explain why or how its predictor leads to its outcome variable. In other words, our findings imply that attitudes influence M-REB via the indirect effect of PBC. These results support the previous argument that the relationship between attitudes and M-REB might decline due to the mediation effect of PBC. In early studies, Ajzen [19] also demonstrated a correlation between attitudes and PBC. The tenuous relationship between attitudes and behavior is not a new issue. Boubonari, et al. [37] found that a high score in attitudes is inconsistent with a low score in collective actions. In this regard, the present study provides statistical evidence that the reason that a high attitude does not translate into actual behavior might be due to the level of one's PBC toward behavior. Therefore, the enhancement of PBC might be crucial to cultivate individual M-REB rather than treat attitudes as the sole predictor. This finding is similar to the review study by Van Dinther, Dochy and Segers [31], self-efficacy/PBC influences motivation and cognition by interacting with the student's task interest, task persistence, the goal they set, the choices they make, and their use of cognitive, metacognitive and self-regulatory strategies.

### 4.2. Limitations

There are some limitations important to recognize and hold implications for future practice. It is noteworthy that the participants in the study are all Han Chinese people. According to Kim and Omizo [38], Atkinson, et al. [39], racial identity is directly related to a positive self-concept. Fischer and Moradi [40] also pointed out that self-efficacy is closely related to ethnic and racial identity. A demographic investigation conducted by Constantine, et al. [41] to assess the relationship between self-efficacy and depression in African, Asian, and Latin American international students has shown that the degree of self-efficacy of both Asian and African students is significantly lower than Latin American students. Regarding our finding of a mediation effect, PBC serves as a crucial part of building individuals' M-REB. It is reasonable to hypothesize that promoting citizens' REB is easier in Americans with a higher degree of PBC than Asians. The different levels of PBC also reveal that the formulation of policies and educational instructions should be varied among distinct ethnic groups. To promote the M-REB of people who already possess higher PBC than western students, the strategies can switch into providing opportunities and resources such as recycling tools to engage them in real behavior. As for students whose PBC are at a relatively low level, a well-designed curriculum which can offer mastery experiences and alleviate the difficulty of performing M-REB might be necessary. Furthermore, the pattern of relations found in the present study might be slightly different due to the diversity of racial/cultural backgrounds. Therefore, we acknowledge that future

studies in exploring whether the relationships between attitudes, PBC, and M-REB are similar to the result of the current study in terms of different cultural backgrounds.

Apart from racial/cultural backgrounds, the difference between M-REB and general REB comes with an important caveat. According to Lee et al. [42], we still know little about the relationship between different types of environmental behavior. In this regard, we are unable to definitively claim that this mediation effect can fully apply to general REB. Therefore, one of our future works aims to investigate whether this mediation effect can apply to different environmental contexts.

#### 4.3. Conclusion and Implications

Our findings have clear implications that provide suggestions for the development of policies and education instructions. To promote individuals' M-REB, the facilitation of their PBC/self-efficacy is necessary. There are four main sources described by Bandura [43] to foster one's PBC/self-efficacy: enactive mastery experiences, vicarious experience, verbal persuasion, and physiological/affective states. Enactive mastery experiences are authentic successes in dealing with a particular situation. According to Palmer [44], these mastery experiences are the most powerful source of creating a strong sense of efficacy due to authentic evidence that an individual can succeed in a certain task. Wen and Lu [9] also noted that involvement in field trips indirectly influences students' behaviors toward the marine environmental protection. The second source of improving one's self-efficacy is the vicarious experience, which refers to observational experiences provided by social models. In other words, individuals perceive the information about their capabilities by observing significant others, and thereby evaluate the difficulty in performing a certain task [45]. The study from Stern et al. also suggested that students who expressed known adults (parents, teacher) as role models exhibited a higher score on the responsible environmental index [12]. The third source is verbal persuasion. People are more willing to persist in a challenging situation if significant others demonstrate high confidence in their capabilities than if they express doubts. The fourth source concerns one's physiological state. People derive efficacy information from their physiological indexes such as heart rate and sweating. These symptoms signaling anxiety might be interpreted as a lack of necessary skills [45]. In summary, the direction of policy-making processes and education should not only emphasize the importance of one's attitudes toward the environment but also strive for the establishment of one's PBC/self-efficacy by creating opportunities to absorb successful experiences or decreasing the difficulty of performing M-REB.

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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

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