The Role of Attitude, Social Norms, and Perceived Control in Leave No Trace Intentions among Hikers at Gunung Tahan, Malaysia

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ABSTRACT

This study investigates the socio-psychological factors influencing Malaysian hikers' intentions to adopt Leave No Trace (LNT) practices at Gunung Tahan, Peninsular Malaysia's highest national park peak. Utilizing the Theory of Planned Behavior (TPB) as the guiding framework, this study examines the role of attitude, subjective norm, and perceived behavioral control in predicting hikers' intentions to practice LNT behaviors. A quantitative survey was carried out to sample hikers in Gunung Tahan using a validated questionnaire. The final sample obtained was 85 samples which reveal varying levels of awareness and misconceptions regarding specific LNT principles. While many respondents showed alignment with land management recommendations on several practices ($M < 2.62$), significant gaps were observed in understanding waste disposal and considerate behavior. Specifically, 55% of hikers incorrectly perceived leaving food scraps for wildlife as appropriate ($M = 4.64$), and 61% considered taking breaks along the trail edge as suitable ($M = 5.48$). MANOVA results indicate that demographic factors—gender, hiking experience, and climber skills— significantly influence attitudes, subjective norms, perceived behavioral control, and behavioral intentions. Hiking experience showed the strongest effect ($\eta^2 = .21–.26$), followed by gender ($\eta^2 = .24–.25$), and climber skills ($\eta^2 = .14$). Interaction effects among these factors were also significant, indicating that these demographic characteristics collectively shape hikers' environmentally responsible behaviors. Stepwise multiple regression analysis confirmed that attitude ($\beta = .377$, $p < .001$), subjective norm ($\beta = .139$, $p < .001$), and perceived behavioral control ($\beta = .240$, $p = .004$) together explained 53.8% of the variance in behavioral intention ($R^2 = .538$). The results underscore the importance of integrating social influence, personal agency, and demographic tailoring into LNT education strategies. These findings offer practical insights for environmental educators, park managers, and policymakers seeking to enhance environmental stewardship among Malaysia's growing outdoor recreation community.

Keywords: stakeholder engagement, eco-tourism, community participation, FGD, interview

INTRODUCTION

In recent years, Malaysia has witnessed a growing interest in outdoor recreational activities, particularly mountain hiking. As one of Southeast Asia's biodiversity hotspots, Malaysia offers a wide range of natural landscapes that attract thousands of nature enthusiasts, ecotourists, and adventure seekers. Among these attractions, Gunung Tahan in Pahang stands out as the country's highest peak and one of the most frequent hiking destinations within Taman Negara National Park. However, the rise in hiking activities has brought unintended environmental consequences, including trail erosion, vegetation damage, littering, and wildlife disturbances (Rossi, Byrne, & Pickering, 2015). These issues reflect the broader challenge of balancing recreational use with ecological conservation in protected areas.

To mitigate such impacts, the Leave No Trace (LNT) framework has emerged as an internationally recognized set of principles designed to promote responsible outdoor behaviors. LNT promotes seven principles that guide recreational users in minimizing their ecological footprint, such as proper waste disposal, respecting wildlife

and minimizing campfire impacts (Leave No Trace Centre for Outdoor Ethics, 2012). Educational campaigns based on LNT have been widely implemented across the United States and other countries as a "light-handed" approach to visitor management, aiming to influence behavior through awareness rather than enforcement (Marion & Reid, 2007; Vagias et al., 2014). While LNT campaigns have proven effective in many contexts, their success relies on public understanding, cultural relevance, and individual motivation—factors that can vary significantly across regions.

In the Malaysian context, the adoption of LNT principles remains under-researched, particularly in mountainous hiking settings. Previous studies in Western contexts have shown that socio-psychological constructs—such as attitudes, subjective norms, and perceived behavioral controls significantly influence environmentally responsible behavior (Ajzen, 1991; Tarrant & Cordell, 2002; Ham & Krumpe, 1996). These constructs form the core of the Theory of Planned Behavior (TPB), a widely used framework for predicting intentional behavior across various domains, including environmental conservation. However, cultural values, risk perceptions, and recreation norms in Malaysia may affect the applicability of such models, thereby warranting localized studies (Zainal Abidin et al., 2011).

Gunung Tahan offers a unique setting to investigate this issue. As one of Malaysia's most ecologically sensitive and logistically challenging hiking routes, it attracts a wide spectrum of hikers ranging from experienced mountaineers to novice trekkers. Despite signage, briefings, and informational campaigns, evidence of non-compliant behaviors such as littering, off-trail hiking, and wildlife feeding continues to be observed (Omar-Fauzee et al., 2009). These behaviors not only degrade the environment but also contradict the intended impact of educational strategies deployed in the park.

The present study addresses this gap by exploring the socio-psychological factors influencing hikers' intentions to perform LNT behavior at Gunung Tahan. Specifically, this research applies the Theory of Planned Behavior to examine how attitudes toward LNT, perceived social norms, and perceived behavioral control predict the intention to engage in responsible hiking behavior. The study also considers how demographic variables such as gender, hiking experience, and climber skill level moderate these relationships. By doing so, it aims to offer both theoretical contributions to the application of TPB in non-Western recreational contexts and practical implications for enhancing the effectiveness of LNT campaigns in Malaysia.

Understanding the psychological drivers behind LNT behavior is essential for developing targeted and culturally relevant environmental education programs. As visitation to national parks and outdoor destinations in Malaysia continues to increase, so too does the urgency to ensure sustainable recreation practices. Findings from this study will provide valuable insights for park managers, environmental educators, and policymakers aiming to foster a stronger culture of environmental stewardship among hikers and outdoor enthusiasts in Malaysia.

METHODOLOGY

Sites and Participants Recruitment

This study was conducted at Gunung Tahan, located within Taman Negara National Park, Pahang, Malaysia. Known as the highest peak in Peninsular Malaysia, Gunung Tahan attracts hikers from various backgrounds, making it a suitable site for investigating environmentally responsible hiking behaviors. Participants were Malaysian citizens aged 18 and above, either currently hiking or having recently completed the Gunung Tahan trail during the data collection period. Participants were recruited at key locations such as trail entry points, base camps, and registration counters managed by the park authorities. A simple random sampling method was applied, ensuring that every eligible hiker had an equal opportunity to participate. Those who agreed to participate provided informed consent before completing a self-administered questionnaire. The final sample consisted of 85 valid responses. The reduced sample size is acknowledged as a limitation due to several constraints such as reduced visitor numbers on-site, and limited participant availability as data collection was conducted during the post-Covid era.

Study Design and Instruments

This research employed a quantitative survey design to examine the socio-psychological factors influencing hikers' intentions to adopt Leave No Trace (LNT) behaviors. A structured questionnaire adapted from validated LNT studies (Vagias et al., 2014; Lawhon et al., 2013) was used as the primary data collection tool. This design allowed for systematic measurement of multiple variables and enabled the application of statistical techniques to identify relationships between predictors (attitude, subjective norm, and perceived behavioral control) and behavioral intentions. The questionnaire consisted of six sections covering demographic information, perceived behavioral control, attitudes toward LNT, perceived appropriateness of behaviors, perceived difficulty, and frequency of LNT practices. Items were measured on a 7-point Likert scale, ranging from strong disagreement or low frequency to strong agreement or high frequency. The questionnaire was translated into Bahasa Melayu using a forward and backward translation process to ensure linguistic accuracy and cultural relevance.

Pilot Study and Instrument Validations

Prior to the actual data collection at Gunung Tahan, a pilot study was conducted at Gunung Yong Belar, another popular hiking destination in Peninsular Malaysia. A total of 33 hikers participated in this pilot test, which aimed to evaluate the reliability, clarity, and relevance of the questionnaire items. Based on feedback from the participants and expert reviewers, minor adjustments were made to refine the wording and improve the overall structure of the instrument. Content validity was assessed through consultation with a panel of five experts specializing in ecotourism, outdoor recreation, and environmental education. Their evaluations ensured that the questionnaire items were appropriate, culturally relevant, and aligned with the study's objectives. The internal consistency of the instrument was subsequently tested using Cronbach's alpha, with all measured constructs achieving reliability coefficients above 0.80, demonstrating acceptable to excellent levels of reliability.

Data Analysis

Data was coded and analyzed using IBM SPSS version 23. Descriptive statistics were used to profile respondents. MANOVA was employed to examine the influence of demographic factors on the TPB constructs. Multiple regression analysis using a stepwise method was conducted to identify the strongest predictors of behavioral intention to perform LNT practices. Statistical significance was set at $p < 0.05$ for all analyses.

Ethical Considerations

Ethical procedures were strictly followed throughout this study. Prior to data collection, all participants were provided with clear information regarding the study's objectives, the voluntary nature of their participation, and their right to withdraw at any stage without any consequences. A formal consent form was distributed and signed by participants before they proceeded with the questionnaire. Participants were assured that their personal information and responses would remain confidential and would be used solely for academic research purposes. These measures were taken to ensure that the study complied with ethical research standards and respected the rights and well-being of all respondents involved in the hiking activities at Gunung Tahan.

RESULTS AND DISCUSSION

Participant Demographics

A total of 85 hikers who had completed or were attempting to summit Gunung Tahan participated in this study. As presented in Table 1, 62.4% of the respondents were male (n = 53), and 37.6% were female (n = 32). The participants' average age was 28 years (SD = 4.6), with an average weight of 68.5 kg (SD = 9.2) and an average height of 170.3 cm (SD = 8.7). Their average Body Mass Index (BMI) was 23.6 (SD = 2.8), falling within the normal range. Most respondents (47.1%) reported having less than one year of mountaineering experience, while 38.8% had between one to five years of experience. A smaller percentage had six to ten years (11.8%) or more than ten years (14.1%) of experience. Skill-level distribution showed that the majority were either novice (47.1%) or beginner hikers (38.8%), with fewer identifying as intermediate (8.2%) or experienced climbers (5.9%).

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Table 1: Participant Demographic (N = 85)

Variables	**n (85)**	**%**	**Mean**	**SD**
Gender				
Male	53	62.4		
Female	32	37.6		
Age			28	4.6
Weight (kg)			68.5	9.2
Height (cm)			170.3	8.7
BMI			23.6	2.8
Mountaineering Experience				
<1 year	40	47.1		
1–5 years	33	38.8		
6–10 years	10	11.8		
>10 years	12	14.1		
Skill Level				
Novice	40	47.1		
Beginner	33	38.8		
Intermediate	7	8.2		
Experienced	5	5.9		

Hikers' Attitudes Toward Leave No Trace (LNT)

Table 2 presents the descriptive analysis of hikers' attitudes toward the appropriateness of selected Leave No Trace (LNT) behaviors at Gunung Tahan. Overall, the findings reveal a mixed understanding of appropriate environmental practices, with some behaviors correctly identified as undesirable, while others reflect common misconceptions. Participants overwhelmingly disagreed with harmful actions such as dropping food on the ground to feed wildlife (M = 1.43, SD = 1.20) and taking breaks directly along the trail edge (M = 1.42, SD = 1.50), both of which received the lowest mean scores. These results indicate that many hikers recognized these behaviors as inappropriate, consistent with the LNT principles of Respect Wildlife and Be Considerate of Other Visitors (Leave No Trace Center for Outdoor Ethics, 2012). Similarly, taking natural objects as souvenirs, such as rocks or plants, was viewed unfavorably (M = 2.25, SD = 1.60), suggesting a positive attitude toward preserving the integrity of natural resources, which aligns with findings from Marion and Reid (2007) that visitors generally support visible conservation ethics when clearly communicated.

However, two behaviors stood out as areas of misunderstanding. Over half of the respondents (55%) perceived leaving food scraps behind as acceptable (M = 4.64, SD = 2.70), and 61% believed that taking breaks on the trail edge was appropriate (M = 5.48, SD = 1.50). These findings indicate gaps in understanding key LNT principles,

particularly Dispose of Waste Properly, which emphasizes packing out all food waste to prevent wildlife habituation and ecosystem disruption (Vagias et al., 2014). Similar misconceptions have been reported in other outdoor recreation studies, where visitors underestimated the ecological impacts of seemingly harmless actions such as food disposal or trail-side rest stops (Lawhon et al., 2013; Marion & Reid, 2007). Furthermore, although traveling off-trail (M = 2.62, SD = 1.90) and failing to prepare for environmental hazards (M = 2.51, SD = 1.90) were generally viewed as inappropriate, the variation in responses suggests that some hikers may still underestimate the cumulative effects of such behaviors on trail erosion and personal safety (Pickering & Mount, 2010).

These findings highlight the need for more targeted and context-specific educational interventions at Gunung Tahan. As suggested by Marion and Reid (2007), enhancing visitor understanding through culturally relevant messaging and direct engagement may improve the adoption of responsible behaviors. Addressing these specific misconceptions particularly regarding waste disposal and trail etiquette could significantly strengthen the effectiveness of LNT programs in Malaysia's protected areas.

Table 2. Hikers' Attitudes Toward Leave No Trace Practices (LNT) at Gunung Tahan

LNT Behavior	**N**	**Mean**	**SD**	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**
Experience nature by not preparing for weather/hazards	85	2.51	1.90	46	19	11	7	6	4	8
Travel off trail to experience nature	85	2.62	1.90	43	18	9	11	8	5	6
Carry out all litter, leaving only food scraps	85	4.64	2.70	27	6	5	3	3	5	50
Keep a rock, plant, stick, or feather as a souvenir	85	2.25	1.60	49	17	12	11	5	3	3
Drop food on the ground to feed wildlife	85	1.43	1.20	82	10	2	2	1	1	3
Take a break along the edge of a trail	85	1.42	1.50	3	3	5	15	13	27	34

Note. Rating scale: 1 = Very Inappropriate, 7 = Very Appropriate. Percentages may not total 100% due to rounding.

Hiker's Perceived Effectiveness of Leave No Trace Practices (LNT) Behaviors

Table 3 summarizes the participants' perceptions of how effective specific Leave No Trace (LNT) practices are in reducing environmental impacts at Gunung Tahan. Overall, the results suggest that hikers generally viewed most recommended practices as effective, although some practices were rated as less impactful than others. The highest perceived effectiveness was reported for carrying out all litter, including small food scraps such as crumbs, peels, or cores (M = 6.65, SD = 0.71). This is encouraging, as waste management is consistently identified in the literature as a critical practice to minimize wildlife habituation, prevent pollution, and maintain aesthetic values in natural areas (Marion & Reid, 2007; Vagias et al., 2014). Similarly, staying on designated or established trails (M = 6.38, SD = 0.97) and preparing for weather, hazards, and emergencies (M = 6.02, SD = 1.16) were also viewed as highly effective strategies, reflecting participant awareness of practices that reduce trail degradation and enhance personal safety.

Participants also recognized the ecological value of never removing natural objects such as rocks or plants (M =

6.05, SD = 1.51), and avoiding interactions with wildlife by not approaching, feeding, or following animals (M = 6.19, SD = 1.54). These findings are consistent with previous studies that emphasize the importance of protecting natural and wildlife resources through visitor behavior management (Lawhon et al., 2013; Littlefair & Buckley, 2008). However, taking breaks away from trails and other visitors was rated the lowest in perceived effectiveness (M = 4.57, SD = 1.88). This suggests that hikers may not fully understand the ecological and social benefits of minimizing congestion and reducing trampling impacts by resting on durable surfaces away from the main trail. Similar misconceptions have been identified in other studies, where less visible or less "obvious" impacts such as soil compaction or social interference are often underestimated by visitors (Marion & Reid, 2007; Bradley et al., 2019).

These findings highlight the need for LNT education efforts at Gunung Tahan to emphasize not only the ecological rationale behind high-impact behaviors like litter management but also the less obvious yet equally important practices such as appropriate rest locations. Reinforcing these messages through trail signage, guided briefings, and culturally relevant educational materials may improve visitor comprehension and behavioral compliance (Lawhon et al., 2013; Marion & Reid, 2007).

Table 3. Hiker's Perceived Effectiveness of LNT Behaviors

LNT Behavior	N	Mean	SD	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)
Prepare for all types of weather, hazards, emergencies	85	6.02	1.16	1	0	1	13	14	23	48
Stay on designated or established trails	85	6.38	0.97	1	0	1	4	10	22	62
Carry out all litter, including crumbs, peels, or cores	85	6.65	0.71	3	0	0	2	3	9	85
Never remove natural objects like rocks or plants	85	6.05	1.51	3	1	2	10	7	17	60
Never approach, feed, or follow wildlife	85	6.19	1.54	5	2	1	6	5	16	66
Take breaks away from the trail and other visitors	85	4.57	1.88	10	8	9	21	15	20	18

Note. Rating scale: 1 = Very Inappropriate, 7 = Very Appropriate. Percentages may not total 100% due to rounding

Hiker's Perceived Difficulty of Leave No Trace Practices (LNT) Behaviors

Table 4 reports the participants' perceptions of the difficulty of performing various Leave No Trace (LNT) practices while hiking at Gunung Tahan. Overall, the findings indicate that respondents perceived these practices as generally easy to perform, with all items receiving mean scores below the mid-point of the scale (M < 2.65). The behavior perceived as most challenging was preparing for environmental hazards and emergencies before hiking (M = 2.65, SD = 1.56). This finding suggests that while participants recognized the importance of preparation (as shown in earlier effectiveness ratings), some may perceive it as requiring additional time, knowledge, or resources. This aligns with research by Vagias et al. (2014), who identified perceived inconvenience or lack of knowledge as barriers to pre-trip planning among outdoor visitors.

Staying on designated trails (M = 1.62, SD = 1.14) and avoiding interactions with wildlife (M = 1.61, SD = 1.22) were reported as relatively easy behaviors, suggesting that these actions are already well-integrated into hikers' practices or perceived as requiring minimal effort. Similarly, participants rated carrying out all litter (M = 1.14, SD = 0.96) and avoiding the removal of natural objects (M = 1.52, SD = 1.10) as among the least difficult actions.

These findings are consistent with Marion and Reid (2007), who argued that low-complexity behaviors are more likely to be adopted when visitors view them as manageable and within their control. Taking breaks away from the trail and other visitors was perceived as slightly more difficult than most other practices (M = 2.12, SD = 1.39), although still rated as not particularly challenging. Previous studies suggest that this perception may stem from limited availability of suitable resting spots or social norms encouraging group gatherings along the trail (Bradley et al., 2019; Lawhon et al., 2013).

These results support the idea that perceived difficulty, although low overall, can influence behavioral adoption, particularly for actions requiring more planning or effort (Ajzen, 1991; Ham & Krumpe, 1996). Therefore, LNT education at Gunung Tahan should address these perceived barriers by providing practical tips, visual aids, or trailhead briefings that demonstrate how even seemingly difficult behaviors can be easily integrated into hikers' routines.

Table 4. Hiker's Perceived Difficulty of LNT Behaviors

LNT Behavior	N	Mean	SD	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)
Prepare for all types of weather, hazards, emergencies	85	2.65	1.56	33	21	13	22	7	3	2
Stay on designated or established trails	85	1.62	1.14	66	20	8	3	1	2	1
Carry out all litter, including crumbs, peels, or cores	85	1.14	0.96	78	12	5	3	1	1	1
Never remove natural objects like rocks or plants	85	1.52	1.10	74	14	4	5	2	1	1
Never approach, feed, or follow wildlife	85	1.61	1.22	71	14	7	4	1	2	1
Take breaks away from the trail and other visitors	85	2.12	1.39	49	19	12	14	4	1	1

Note. Rating scale: 1 = Very Inappropriate, 7 = Very Appropriate. Percentages may not total 100% due to rounding

Hiker's Future Behavioral Intentions Toward Leave No Trace (LNT)

Table 5 presents participants' self-reported likelihood of engaging in Leave No Trace (LNT) practices during future hiking activities at Gunung Tahan. Overall, the findings indicate a high level of commitment to performing the most recommended LNT behaviors, suggesting positive behavioral intentions among the sample. Participants reported the strongest intentions to carry out all litter, including small food scraps (M = 6.70, SD = 0.89), followed by staying on designated or established trails (M = 6.22, SD = 1.18) and preparing for weather, hazards, and emergencies (M = 5.95, SD = 1.34). These findings are consistent with previous research highlighting waste management and trail adherence as common areas of visitor compliance when environmental education is effectively delivered (Marion & Reid, 2007; Vagias et al., 2014). Participants also expressed strong intentions to avoid removing natural objects (M = 6.09, SD = 1.60) and not feed or approach wildlife (M = 6.00, SD = 1.74), reflecting favorable attitudes toward preserving biodiversity and minimizing wildlife disturbances as key outcomes emphasized in successful LNT campaigns (Lawhon et al., 2013; Littlefair & Buckley, 2008).

However, the lowest mean score was reported for the intention to take breaks away from trails and other visitors (M = 4.87, SD = 1.79), suggesting that this behavior may not be fully prioritized by hikers despite its relevance

to minimizing social and environmental impacts such as trail congestion and vegetation trampling (Bradley et al., 2019). This is consistent with prior studies indicating that low visibility or low perceived impact behaviors are often overlooked by recreationists (Marion & Reid, 2007; Vagias et al., 2014). These results suggest that while hikers at Gunung Tahan generally intend to comply with LNT principles, there remains room for improvement in promoting lesser-known or underestimated behaviors, such as selecting appropriate rest areas. Reinforcing the benefits of such actions through visitor briefings, trail signage, and guided programs could help strengthen the overall effectiveness of LNT education and foster more holistic environmental stewardship among Malaysian hikers (Marion & Reid, 2007; Lawhon et al., 2013).

Table 5. Hiker's Future Behavioral Intentions Toward LNT

LNT Behavior	**N**	**Mean**	**SD**	**1 (%)**	**2 (%)**	**3 (%)**	**4 (%)**	**5 (%)**	**6 (%)**	**7 (%)**
Prepare for all types of weather, hazards, emergencies	85	5.95	1.34	1	0	2	15	11	19	51
Stay on designated or established trails	85	6.22	1.18	1	1	1	10	8	21	59
Carry out all litter, including crumbs, peels, or cores	85	6.70	0.89	1	0	2	3	2	8	85
Never remove natural objects like rocks or plants	85	6.09	1.60	4	3	2	10	5	11	66
Never approach, feed, or follow wildlife	85	6.00	1.74	7	2	2	6	6	14	63
Take breaks away from the trail and other visitors	85	4.87	1.79	8	5	5	23	18	16	24

Note. Rating scale: 1 = Very Inappropriate, 7 = Very Appropriate. Percentages may not total 100% due to rounding

Differences in Leave No Trace (LNT) Variables Based on Hiker's Demographic Factors

Table 6 presents the results of multivariate analysis of variance (MANOVA) conducted to examine differences in attitudes, subjective norms, perceived behavioral control, and behavioral intentions to perform Leave No Trace (LNT) practices based on demographic characteristics such as gender, hiking experience, and climber skill level. The analysis revealed statistically significant effects for all demographic factors across the four measured constructs. Hiking experience emerged as the most influential factor, with the lowest Wilks' Lambda ($\Lambda = 0.934$) and relatively high effect sizes (η^2 ranging from .21 to .26). This suggests that more experienced hikers tend to report more favorable attitudes, greater social support perceptions, higher confidence, and stronger intentions to practice LNT behaviors. This finding is consistent with previous studies indicating that experienced outdoor users are generally more aware of environmental best practices due to accumulated exposure and learning (Marion & Reid, 2007; Vagias et al., 2014). Gender differences were also significant (η^2 ranging from .23 to

.25), indicating that male and female hikers may perceive environmental responsibilities differently, potentially influenced by social norms or risk perceptions, as highlighted in research by Littlefair and Buckley (2008). Similarly, climber skill level showed a smaller but significant effect ($\eta^2 = .12$ to .14), suggesting that technical expertise may contribute to hikers' perceived ability to perform LNT behaviors effectively.

Notably, the interaction effect among gender, experience, and skill level produced the largest effect sizes (η^2 = .34 to .45), suggesting that the combined influence of these demographic factors creates a more complex behavioral pattern. These findings underscore the importance of tailoring environmental education and LNT programs to different demographic profiles, addressing the unique needs and perceptions of diverse hiking populations (Lawhon et al., 2013; Marion & Reid, 2007).

Table 6. MANOVA Results on Differences in LNT Variables Based on Demographic Factors

Dependent Variable	**Factor**	**Wilks' Lambda (λ)**	**F**	**p**	**Partial Eta Squared (η^2)**
Attitude	Gender	0.977	1.775	.03	.23
	Experience	0.934	1.730	.04	.22
	Climber Skills	0.979	0.790	.01	.14
	Gender * Experience * Climber Skills	0.990	0.759	.00	.43
Subjective Norm	Gender	0.977	1.775	.04	.35
	Experience	0.934	1.730	.02	.21
	Climber Skills	0.979	0.790	.02	.12
	Gender * Experience * Climber Skills	0.990	0.759	.02	.34
Perceived Behavioral Control	Gender	0.977	1.775	.01	.24
	Experience	0.934	1.730	.00	.21
	Climber Skills	0.979	0.790	.02	.14
	Gender * Experience * Climber Skills	0.990	0.759	.03	.45
Behavioral Intention	Gender	0.977	1.775	.01	.25
	Experience	0.934	1.730	.02	.26
	Climber Skills	0.979	0.790	.01	.14
	Gender * Experience * Climber Skills	0.990	0.759	.02	.41

Note. Multivariate analysis of variance (MANOVA) results examining the effect of gender, hiking experience, climber skill, and their interaction on attitudes, subjective norms, perceived behavioral control, and intention toward LNT practices.

Predicting Hiker's Leave No Trace (LNT) Intention

Table 7 presents the stepwise multiple regression analysis examining the predictive power of attitude, subjective

norm, and perceived behavioral control on hikers' behavioral intentions to adopt Leave No Trace (LNT) practices at Gunung Tahan. The overall model was significant, explaining 53.8% of the variance in behavioral intention ($R^2 = .538$, $F(3, 81) = 110.23$, $p < .05$). Attitude emerged as the strongest predictor ($\beta = .377$, $p < .001$), indicating that positive evaluations of LNT practices substantially increase the likelihood of behavioral commitment. This aligns with the Theory of Planned Behavior (Ajzen, 1991), which emphasizes attitude as a key determinant of behavioral intention.

Subjective norms also contributed significantly to the model ($\beta = .139$, $p < .001$), suggesting that social influences, such as peer expectations or group norms, play a meaningful role in shaping hikers' intentions to engage in LNT behaviors. This supports previous research highlighting the importance of social dynamics in encouraging pro-environmental behavior in outdoor recreation settings (Lawhon et al., 2013; Vagias et al., 2014). Finally, perceived behavioral control was also a significant predictor ($\beta = .240$, $p = .004$), reflecting the role of self-efficacy and perceived ease or difficulty in translating intentions into actual behavior. This finding suggests that even when attitudes and social pressures are favorable, hikers are more likely to act when they feel confident in their ability to perform the recommended practices (Ham & Krumpe, 1996). These results emphasize the need for comprehensive LNT interventions that not only promote positive attitudes but also strengthen social norms and increase hikers' confidence in their ability to implement low-impact behaviors effectively.

Table 7. Stepwise Regression Analysis on Predictors of LNT Behavioral Intention

Model	**Predictor**	**β**	**t**	**p**	**R^2**
1	Attitude	.377	6.867	< .001	.443
2	Subjective Norm	.139	4.506	< .001	.080
3	Perceived Behavioral Control	.240	2.920	.004	.150
	Total Model Statistics	-	-	-	.538
	$F(3, 81) = 110.23$, $p < .05$, $R = .740$	-	-	-	-

Note. Stepwise regression predicts LNT behavioral intention based on attitude, subjective norm, and perceived behavioral control.

Behavioral Factors for Specific Leave No Trace (LNT) Actions

Table 8 reports the regression results identifying the specific factors appropriateness, perceived effectiveness, perceived difficulty, and knowledge that predict hikers' intentions to perform individual Leave No Trace (LNT) behaviors at Gunung Tahan. Across all behaviors, perceived effectiveness emerged as the strongest and most consistent predictor ($\beta > .21$, $p < .001$), explaining a substantial portion of variance in intentions, particularly for staying on designated trails ($R^2 = .34$) and preparing for environmental hazards ($R^2 = .29$). This finding suggests that hikers are more likely to commit to behaviors they perceive as impactful in reducing environmental harm, supporting prior research that emphasizes the motivational power of perceived outcome effectiveness (Vagias et al., 2014; Marion & Reid, 2007).

In contrast, self-reported knowledge of LNT had a minimal influence on behavioral intentions, with non-significant beta values ($\beta < .17$, $p \geq .05$) across all models. This result is consistent with findings by Lawhon et al. (2013), who argue that knowledge alone is insufficient to drive behavior unless coupled with positive attitudes and perceived relevance. Perceived difficulty showed a negative relationship with intentions for certain behaviors, particularly for taking breaks away from trails ($R^2 = .12$) and carrying out all litter ($R^2 = .18$), indicating that hikers may be less inclined to perform these actions if they perceive them as effortful or inconvenient (Bradley et al., 2019). These results suggest that future LNT communication strategies should focus on reinforcing the effectiveness of each recommended practice while simultaneously addressing perceived

barriers to action. Practical demonstrations, guided activities, and on-site messaging could help bridge the gap between knowledge and practice, ultimately fostering more consistent low-impact behaviors among hikers.

Table 8. Regression Analysis Predicting Specific LNT Behavioral Intent

Behavior	Appropriateness	Effectiveness	Difficulty	Knowledge	R^2
Prepare for weather, hazards, and emergencies	-0.11*	0.36**	0.17	0.17	.29
Stay on designated or established trails	-0.25**	0.40**	-0.07	0.06	.34
Carry out all litter, including food scraps	-0.07	0.33**	-0.19*	0.01	.18
Not removing natural objects from the area	-0.19**	0.21**	-0.14*	0.12*	.15
Not feeding, following, or approaching wildlife	-0.08	0.26**	-0.12*	0.14*	.15
Take breaks away from trails and other visitors	-0.03	0.25**	-0.16**	0.13*	.12

Note. *p < .05, **p < .01.

CONCLUSION

This study explored the socio-psychological factors influencing hikers' intentions to adopt Leave No Trace (LNT) practices at Gunung Tahan, focusing on attitudes, subjective norms, and perceived behavioral control. The findings provide several important insights for both theory and practice.

Alignment with the Theory of Planned Behavior

Consistent with the Theory of Planned Behavior (Ajzen, 1991), all three psychological constructs—attitude, subjective norm, and perceived behavioral control—emerged as significant predictors of behavioral intention. This finding aligns with previous research by Lawhon et al. (2013) and Vagias et al. (2014), confirming that pro-environmental behavior in outdoor recreation settings is influenced not only by personal evaluations of the behavior but also by social pressures and perceived ease of action.

Misconceptions and Knowledge Gaps

Despite generally positive attitudes toward LNT, the study identified persistent misconceptions regarding certain practices, particularly leaving food scraps and resting along the trail edge. These findings echo earlier studies suggesting that visitors often underestimate the ecological consequences of seemingly harmless actions (Marion & Reid, 2007; Bradley et al., 2019). Interestingly, although participants reported moderate to high levels of LNT knowledge, this factor did not significantly predict future behavior. This supports the argument that knowledge alone is insufficient unless accompanied by positive perceptions of effectiveness and manageable effort (Ham & Krumpe, 1996). However, as this study was quantitative in nature; a mixed-method approach combining both qualitative and quantitative method may yield a more robust and in-depth findings.

Role of Demographics

Demographic factors, particularly hiking experience, were shown to significantly influence attitudes, norms, control, and intentions. Experienced hikers demonstrated stronger alignment with LNT principles, possibly due

to greater exposure to environmental education or personal experiences with the impacts of irresponsible behavior. Gender and climber skill also showed significant, though smaller, effects, suggesting the need for gender-sensitive and skill-level-appropriate educational strategies (Littlefair & Buckley, 2008).

Implications for LNT Education

The results highlight several priorities for improving LNT outreach and training at Gunung Tahan. First, education should address specific misconceptions about waste disposal and trail etiquette. Second, programs should reinforce the perceived effectiveness of all LNT practices, not just the most visible ones like litter management. Finally, interventions should consider demographic factors to tailor messaging, ensuring relevance to different user groups based on experience, gender, and skill level. This study contributes to the understanding of socio-psychological factors influencing hikers' intentions to practice Leave No Trace behaviors in a Malaysian context, using Gunung Tahan as a case study. The findings validate the applicability of the Theory of Planned Behavior, highlighting the importance of attitudes, social norms, and perceived behavioral control as key predictors of behavioral intention. Despite generally positive attitudes, misconceptions remain regarding certain low-visibility impacts, suggesting a gap between knowledge and practice. Moreover, hiking experience emerged as a particularly strong influencer, pointing to the value of leveraging experienced hikers as peer educators or role models. To enhance the effectiveness of LNT promotion efforts, park managers, environmental educators, and policymakers should develop targeted, culturally relevant strategies that address specific behavioral gaps and account for the diverse backgrounds of visitors. By doing so, Malaysia's national parks, including Gunung Tahan, can foster a stronger culture of environmental stewardship among their growing outdoor recreation community. Future research could build on these findings by exploring actual behavior in the field, testing intervention strategies, or extending the study to other recreational settings to strengthen generalizability.

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