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Improving Pro-Environmental Behavior of Nursing Students Based on Protection Motivation Theory

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Abstract:
Background: Human activity patterns have a significant impact on the quality of the environment. As members of the community's, university students bear the weight of past and present environmental negligence. Protection motivation theory offers an effective framework for understanding pro-environmental behaviors and decisions. **Aim:** The aim of this study was to examine the improvement of the pro-environmental behavior of nursing students based on protection motivation theory. **Design:** The quasi-experimental research design was implemented. **Setting:** The study was carried out at Faculty of Nursing Benha University. **Sample:** A systematic random sample of 25% of fourth year nursing undergraduate students of academic year 2024- 2025 (250 student) **Tools:** Two primary instruments were implemented **I**: A structured interviewing questionnaire consisted of two parts: the demographic characteristics and Pro-Environmental Behavior questionnaire, **II:** Protection motivation theory. **Results:** There was highly statistically significant difference between mean scores of all items of the pro-environmental behavior of studied nursing students' at pre and post application of protection motivational theory phases with (p- value ≤0.001). **Conclusion:** Using protection motivation theory is an effective method and plays a vital role at inducing a significant change for improving pro-environmental behavior. **Recommendations:** Integrate Environmental ethics In Nursing Education; Future researchers can utilize this theory as a foundation for examining the pro-environmental behaviors of various social groups and gaining insights into the factors that affect these behaviors.

Keywords: Motivation Theory, Nursing Students, Pro-Environmental Behavior & Protection.

Introduction
The growing environmental challenges, such as climate change, pollution, deforestation, and biodiversity loss, have increased the need for sustainable actions. One of the most effective ways to address the issues of environment is by adopting Pro-Environmental Behavior (PEB) which refers to actions that individuals take to reduce negative impact on the environment and promote sustainability. Encouraging PEB through education, incentives, and community initiatives is essential for addressing global environmental challenges and ensuring a healthier planet for future generations **(Berger& Wyss, 2021; Tian, & Liu, 2022).**

Human behavior plays a key role in the rise and severity of environmental problems, as daily actions and lifestyle choices directly affect the planet's health. The demand for industrial production, single-use plastics, and unsustainable agricultural practices further accelerates environmental degradation **(Gómez et al., 2024).** Additionally, behaviors driven by convenience, lack of awareness, or economic incentives often lead to unsustainable practices that harm ecosystems. However, human behavior also holds the key to solutions by adopting PEB such as conservation, responsible consumption, and sustainable waste management, individuals and societies can mitigate environmental damage and promote long-term ecological balance. Encouraging awareness, policy changes, and behavioral shifts toward sustainability is essential in addressing the growing environmental crisis **(Jans, 2021; Dioba, et al., 2024).**

Promoting Pro-environmental Behavior (PEB) is an issue that affects both the environment and society. Individuals who are highly educated and possess significant environmental awareness and motivation are more likely to exhibit responsible behavior **(Colombo et al., 2023)**. Certain people might feel motivated to participate in pro-environmental behavior (PEB) due to their personal identity and values related to the environment. Additionally, PEB is affected by various specific factors, such as commitment to environmental issues, adopting a green or pro-environmental lifestyle, self-efficacy, awareness or consciousness regarding the environment, and differences in goal framing **(Udall et al., 2020).**

Egypt is a demographic powerhouse on the African continent and a rapidly expanding emergent economy. The natural environment, especially the rich biodiversity, is under increasing strain due to

factors like pollution, climate change, land-use change, and high population growth. By emphasizing policy support, community involvement, and education, pro-environmental behavior in Egypt can be improved. As members of the community's youth, university students bear the weight of past and present environmental negligence. At the same time, the important individuals who acquire the technical expertise necessary to develop appropriate solutions to alter environmental behavior **(Yezid et al., 2023)**

Colleges, universities, and training facilities are crucial in promoting PEB since it is simple to encourage behavioral change among younger generations. Additionally, because of sustainability aims and the consequences for student enrollment, organizations are interested in making pro-environmental changes in the context of education **(Liu& Green, 2024).** By stepping up environmental education, pupils could be more interested in engaging in sustainable environmental behavior. Intentions and devotion to green products, gender disparities in pro-environmental behavior, food-related environmental attitudes and practices, electronic environmental awareness, and even the use of emoticons to encourage recycling are all examples of students' PEB **(Yusliza et al., 2020).**

The Protection Motivation Theory (PMT) developed by Rogers (1975) and explains how individuals make decisions to protect environment and people from threats by assessing risks and the ability to take action. PMToriginally used in health psychology and community and has been applied to environmental behavior to understand how people respond to ecological threats like climate change and pollution. According to PMT, people engage inbPEB when they perceive a serious environmental threat and believe that actions can help to mitigate risks **(Shafiei & Maleksaeidi, 2020).**

The protection motivation theory explains how individuals respond to threats by assessing risks and ability to take action, making it relevant to understanding PEB. According to PMT, people are more likely to engage in environmentally friendly actions when they perceive environmental threats, such as climate change or pollution, as severe and personally relevant. Additionally, the belief in the effectiveness of solutions (response efficacy) and the confidence in the ability to take action (self-efficacy) influence the behavior. For example, individuals who recognize the dangers of plastic pollution and believe that reducing plastic use can make a difference are more likely to adopt sustainable habits. By applying PMT, environmental campaigns can encourage PEB by increasing awareness of ecological risks and empowering individuals with actionable solutions. **(Marikyan & Papagiannidis, 2023).**

By using a broad range of predictors, including the costs and rewards of both present maladaptive conduct and future adaptive behavior, protection motive theory offers a useful framework for explaining pro-environmental decisions. PEB is a key component of many civilizations across the world that have long embraced the objective of creating a more sustainable, environmentally friendly future. **(Kothe et al., 2019).** Indeed, the widely belief that changes in behavior are needed to promote a more sustainable future is important. The basic idea of the PEB is that people engage in adaptive actions when confronted with environmental risks through perceived risk vulnerability and severity on the one hand, and by considering the possibilities to manage the risks through response efficacy and self-efficacy on the other hand **(Balla& Hagger, 2024).**

Community Health Nurses (CHNs) play a crucial role in promoting PEB by educating individuals and communities about the link between environmental health and overall well-being. They advocate for sustainable practices by raising awareness about pollution, climate change, and resource conservation, emphasizing the impact on public health. Through health education programs, CHNs encourage behaviors such as reducing waste, conserving water and energy, and supporting clean air initiatives. They also collaborate with local organizations and policymakers to promote eco-friendly policies, such as reducing hazardous waste and improving sanitation. By integrating environmental health into the practice, CHNs help create healthier living conditions while fostering a culture of sustainability and environmental responsibility **(Luque et al., 2024).**

Significance of study:

As part of Egypt’s Vision 2030, the government is committed to turning environmental challenges into opportunities. Significant progress has been made in addressing air pollution, which continues to be a health concern, and moving toward more sustainable waste management. Egypt's shift to clean energy has a lot of room to speed. Although environmental data and information have generally improved, public involvement in environmental decision-making still needs to be strengthened, according to Egypt's first evaluation of its green growth policy. **(Organization for Economic Co-operation and Development 2024).**

Pro-environmental behavior is crucial in Egypt. Encouraging PEB, such as conserving green areas, reducing pollution, and supporting sustainable urban planning, is essential to mitigate these effects. Go Green Initiative is launched as part of the National Sustainable Development Strategy "Egypt 2030" to preserve marine life, the environment, natural

resources, and natural protectorates. The Ministry of Environment initiated the initiative in addition to raising awareness of the significance of afforestation, waste recycling, food and energy rationalization, reducing air pollution, and reducing plastic use **(Presidency, 2025).**

Aim of study:

This study Aimed to examine the improvement of the pro-environmental behavior of nursing students based on protection motivation theory.

Research hypothesis:

Using the framework of the protection motivation theory is effective in improving pro-environmental behavior of nursing students.

Subject & Methods

Research design

This study used a quasi-experimental design (one group pre/post-test). This methodology does not incorporate randomization and aims to ascertain a causal relationship between the theory application and the resultant outcomes.

Research Setting:

The study was carried out at Faculty of Nursing Benha University. It was selected because they are future healthcare professional who play a vital role in promoting health practices within the community. Their education making them a relevant group for evaluating the behaviors related to pro-environmental health.

Subject:

A. **Type of sample**: A systematic random sample. (every 4th student)
B. **Size of sample:** The sample size was **25%** of fourth year nursing undergraduate students of academic year 2024- 2025.
C. **Tools of data collection:** Data was acquired through the utilization of two tools.

Tool (I): A questionnaire was created by researchers, consisted of two parts.

The First part: the demographic characteristics of the studied students and consisted of six items such as (age, gender, residence place, educational level of the mother, educational level of the father and the membership of any environmental association or organization).

The second part: Pro-Environmental Behavior questionnaire: It was adopted from **(Shafiei & Maleksaeidi, 2020),** modified by researchers. and categorized into seven main dimensions as: General environmental attitudes (3 items with a score range of 3 to 15 such as realize the importance of environmental protection, believe that human activity contributing to climate change, etc…..), environmental knowledge and awareness (5 items with a score range of 5 to 25 such as the term of carbon footprint, the concept of sustainable living, consequences of plastic waste, etc…….), recycling and waste management (5 items with a score range of 5 to 25 as separating recyclables from general waste, compost organic waste, reduce, reuse or recycle instead of buying new things, etc…….), energy and water conservation (5 items with a score range of 5 to 25 such as turn off lights when not in use, using energy efficient light bulbs,, limiting water usage, etc……..), sustainable consumption (5 items with a score range of 5 to 25 such as buying organic product, buying recycled items, buying product with minimal packaging, etc…….), and political participation and advocacy(5 items with a score range of 5 to 25 as participating in environmental advocacy, supporting policies of climate change, supporting organization that have strong environmental policies, etc……..), and personal commitment and behavior (5 items with a score range of 5 to 25 such as committing to living an environmentally sustainable lifestyle, avoiding activities or products that harm the environment, etc…….).

Scoring System for Pro-Environmental Behavior questionnaire

A five-point Likert scale was used to measure the scale, and the results are summarized as: Strongly disagree (1); disagree (2); no idea (3); agree (4) and fully agree (5). The total points were 165. The total scores were constituted positive behavior if the score ≥ 60 % (≥99 points) while constituted negative behavior if it is <60 % (<99 points).

Tool (II): Protection Motivational Theory It was adopted from **(Rainear, and Christensen, 2017)** and modified by researchers. This tool was used pre and post application of theory. It categorized into seven main dimensions as: perceived vulnerability (3items with a score range of 3 to 15such as feeling that your actions can directly impact environmental issues , believing that environmental issues will worsen in the future and affect future generations , etc……).perceived severity (3items with a score range of 3 to 15 such as realizing that environmental problems (e.g., pollution, deforestation) have already caused significant harm to ecosystems, knowing that the destruction of natural resources (e.g., forests, oceans) is a major
global issue, etc……), response efficacy (3items with a score range of 3 to 15 such as recycling to reduce the environmental impact of waste, switching to renewable energy sources to help in reducing climate change, etc……), self-efficacy (3items with a score range of 3 to 15 such as I can reduce my carbon footprint by making sustainable choices, I have the knowledge and resources to live a more eco-friendly lifestyle, etc……).Response cost (3items with a score range of 3 to 15 as the personal cost of

engaging in environmental protection behaviors is too high, it is expensive to switch to environmentally-friendly products, etc…..), behavioral intentions (3items with a score range of 3 to 15 such as intending to reduce my environmental impact by adopting more sustainable habits in the next year, planning to take action to reduce pollution in my community, etc……..)

and General attitudes towards environmental protection (2items with a score range of 2 to 10 as knowing that protecting the environment is a moral responsibility, etc……).

Scoring System for Protection motivation theory questionnaire

A five-point Likert scale was used to measure the scale, and the results are summarized as: Strongly disagree (1); disagree (2); no idea (3); agree (4) and fully agree (5). The total points were 100, divided into three categories. The total scores were constituted high protection if the score ≥ 75 % (≥75points) while constituted moderate protection if it is equals 50-<75 % (50-<75 points) and constituted low protection if it is less than 50% (<50 points).

Tools validity:

Five academic nursing faculty members within the Community Health Nursing department, Benha university conducted a review of the current study to evaluate the content validity of the tools employed. The suggested modifications, including corrections, omissions, and/or additions of certain items, were implemented in response to the assessment conducted by academic nursing specialists regarding the suitability of the content and the clarity of the language used.

Tools reliability:

The reliability was checked using the Cronbach's Alpha coefficient test to make sure that the items in the two tools for collecting data were largely homogeneous. The consistency was shown by the pro-environmental behavior questionnaires internal consistency was 0.954 and the protection motivational theory internal consistency was 0.960.

Pilot study:

A pilot study was conducted with a sample size of 25 students (10%) of the total. Aimed to test the clarity of tools and it also helped to assist in estimating the necessary time for data collection. Subsequent modifications were made based on the findings of the pilot study. In order to avert any potential contamination of the sample, The pilot sample was omitted from the final study.

Ethical consideration:

Benha Faculty of Nursing Research Ethical Committee provided acceptance for the study conduction then the students' consent to participate in the study was taken after being informed that any information gathered about them would be kept private, used just for research purposes. The safety, protection, privacy, and anonymity of the studied student were ensured. Students have the right to leave the study at any time. The ethical approval code REC.CHN.P57

Administrative approval:

In order to obtain consent for the study, the necessary administrative approval taken from the dean of Faculty of Nursing, Benha University, after the research's purpose was clarified.

Educational Intervention Construction:

An educational intervention using the frame of the protection motivation theory was implemented in four distinct phases: **Phase I: Assessment phase**:Before the theory was put into practice, a group interview was conducted with each nursing student to explain the study's goal and to get their email address and mobile number.This interview took about 20 to 30 minutes. To encourage the pro-environmental behaviors that are the subject of the study, the researchers prepared the questionnaire electronically via Google form design and took the permission from head of departments for academic fourth year and explained the aim and the nature of the study and the method of filling the electronic questionnaires to studied students in the department and then the links were sent to studied students through the WhatsApp group to fulfill the pretest, the researchers opened the questionnaire link for one week and responded to the students' inquiries in the event of a problem while filling out the questionnaire through the WhatsApp group.

Phase (II): Planning phase: Informed by the findings derived from the pretest group during the assessment phase, an educational intervention was subsequently formulated. The number of sessions, along with their corresponding content, diverse pedagogical methodologies, and instructional media, was determined based on the pretest outcomes and the specific needs identified among the students participating in the study.

Phase (III). Implementation phase: Data was collected from the beginning of December 2024 till the end of February 2025 covering 3 months. The application of theory was implemented in Faculty of Nursing Benha University. The researchers divided studied students into 10 groups each group 25 students for application PMT. Every group was taken two sessions per the week.The objectives of the study and ethical considerations were thoroughly elucidated. The theory application were administered over 5 sessions (1 theoretical and 4 practical), each with a duration of approximately 30 to 45 minutes.

The application of the theory was developed by the researchers based on the items of PMT.Three

constructs in two groups—Perceived Efficacy and Perceived Costs—make up the PMT Coping Appraisal Pathway. The two components that make up perceived efficacy are response efficacy and self-efficacy. Response efficacy evaluates how well the protective behavior reduces the health hazard, whereas self-efficacy evaluates the perceived capacity to adopt a protective behavior. Response Costs, the only component that makes up Perceived Costs, quantifies the perceived expenses of modifying the protective measure. A booklet containing the content of the program, it was written in a simple Arabic language and supplemented by photos and illustrations to help the students understanding of the content involved. Suitable teaching aids prepared specially for the application of the theory were: A booklet, a flipchart, and interactive lesson, with questions and discussions, and actual circumstances. Questions from nursing students were addressed at the end of each session in order to clear up any misunderstandings that may have occurred. Each session concluded with a summary of the material covered, using straightforward language appropriate for all students, to guarantee that the students understood the program's content. All students received the same protocol content utilizing the same teaching methods in order to guarantee that all subjects were exposed to the same learning experience.

Phase (IV): Evaluation phase: The effectiveness of this application of the theory was assessed through opening the questionnaire link for one week after the application of the theory ending to allow the studied student to fulfill the post- test questionnaire. The post- test questionnaire used for this evaluation had the same format as the pre-test questionnaire then comparing the pro environmental behavior of nursing students before and after the application of the theory

Statistical Design:

Version 25 of the statistical software for social science (SPSS) was used to examine the data. The mean, standard deviation (SD), and range were used to convey numerical data. Frequencies and percentages were used to express the qualitative data. The paired t-test was used to compare the mean scores between two distinct times within the same group, whereas chi-square tests were employed to examine qualitative data within the same group. The Pearson product-moment correlation coefficient was used to assess for correlation between various numerical variables. Multivariate studies using the pro environmental behavior score as the dependent variable were conducted using linear regression. A significant p-value was defined as less than 0.05, while a very significant p-value was defined as less than 0.001.

Results:

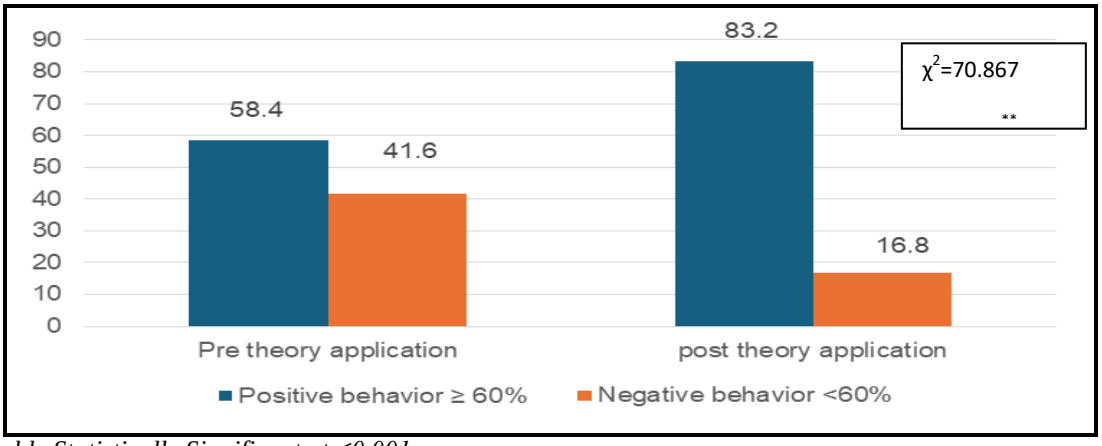
Table (1): Distribution of studied nursing students according to their demographic characteristics (n= 250)

Demographic characteristics	No.=250	
	(No.)	%
Age		
- 18-<20	32	12.8
- 20- 22	194	77.6
->22	24	9.6
Mean ± SD	21.41 ± 0.49	
Gender		
-Female	136	54.4
- Male	114	45.6
Residence		
-Urban	216	86.4
-Rural	34	13.6
Fathers' level of education		
- Can't read and write	26	10.4
- Basic education	36	14.4
- Secondary education	97	38.8
- High level of education	91	36.4
Mothers' level of education		
- Can't read and write	51	20.4
- Basic education	48	19.2
- Secondary education	78	31.2
- High level of education	73	29.2
Membership of environmental organization		
- No	236	94.4
- Yes	14	5.6

Table (2): Difference of studied nursing students' mean score of pro environmental behavior pre and post protection motivational theory application (n=250).

Pro- environmental behavior	Max score	Pre protection motivational theory	Post-protection motivational theory	% of mean post protection motivational theory	Ranking of practices	T test (p value)
		Mean ± SD	Mean ± SD			
General environmental attitudes	15	9.86 ± 1.18	13.32 ± 1.71	88.8%	1	- 23.163 <0.001**
Environmental knowledge and awareness	25	19.43 ± 3.53	19.09 ± 3.48	76.3%	3	- 5.567 <0.001**
Recycling and waste management	25	15.40 ± 1.67	19.82 ± 3.68	79.2%	5	- 19.787 <0.001**
Energy and water conservation	25	18.60 ± 4.49	20.38 ± 3.66	81.5%	3	-7.531 <0.001**
Sustainable consumption	25	16.30 ± 2.21	18.63 ± 3.63	74.5%	7	- 9.591 <0.001**
Political engagement and advocacy	25	16.26 ± 1.87	20.03± 3.72	80.1%	4	-13.349 <0.001**
Personal commitment and behavior	25	18.31 ± 4.65	20.88 ± 3.59	83.5%	2	- 9.807 <0.001**
Total score	165	114.93 ± 11.11	133.62 ± 17.78	-	-	- 19.718 <0.001**

(**) Highly statistically Significant at ≤0.001



(**) Highly Statistically Significant at ≤0.001

Figure (1): Difference of studied nursing students' total level of pro environmental behavior pre and post protection motivational theory application (n=250)

Table (3): Difference of studied nursing students' mean score of protection motivation theory items pre and post program application (n=250)

Protection motivation domains	Max score	Pre Theory application	Post- theory application	% of mean post protection motivational theory	Ranking of practices	T test (p value)
		Mean ± SD	Mean ± SD			
Perceived Vulnerability	15	10.18 ± 1.18	12.57 ± 2.04	83.8 %	3	- 13.640 <0.001**
Perceived severity	15	11.08 ± 1.22	12.45 ± 1.39	83.0 %	4	- 7.717 <0.001**
Response efficacy	15	10.06 ± 1.37	12.15 ± 2.18	81.0 %	7	- 13.100 <0.001**
Self efficacy	15	10.03 ± 1.48	12.19 ± 2.30	81.2 %	6	-13.744 <0.001**

Protection motivation domains	Max score	Pre Theory application	Post- theory application	% of mean post protection motivational theory	Ranking of practices	T test (p value)
		Mean ± SD	Mean ± SD			
Response costs	15	10.16 ± 1.25	12.59 ± 1.89	83.9 %	2	- 14.841 <0.001**
Behavioral intentions	15	10.17 ± 1.31	12.41 ± 2.09	82.7 %	5	-13.256 <0.001**
General attitudes toward environmental protection	10	6.74 ± 0.89	8.86 ± 1.28	88.6 %	1	- 18.303 <0.001**
Total score	100	71.29 ± 6.82	81.55 ± 9.45	-	-	- 9.604 <0.001**

(**) Highly statistically Significant at ≤0.001

Table (4): Correlation coefficient between nursing students' total pro environmental behavior and Protection motivation domains pre and post theory application (n=250).

Variable	Total score of pro environmental behavior			
	Pre theory application		Post theory application	
	r	P value	r	P value
Protection motivation domains	0.202	0.016*	0.686	<0.001**

(*) Statistically Significant at ≤0.05 *** Highly statistically significant p ≤ 0.001*

Table (5): Multiple linear regression analysis for predictor variables of pro environmental behavior post theory application (n=250).

Pro environmental behavior	Standardized Coefficients	Unstandardized Coefficients		t	Sig.
	Beta	B	Std. Error		
(Constant)	39.201	12.046		3.254	.001
Age	-3.639-	2.506	-.075-	-1.452-	.148
Sex	1.457	1.630	.043	.894	.372
Residence	12.094	3.412	.188	3.545	<0.001**
Fathers' level of education	-1.017-	.974	-.055-	-1.044-	.298
Mothers' level of education	2.070	.946	.124	2.187	0.030*
Membership of environmental organization	-10.878-	3.352	-.159-	-3.245-	0.001**
Protection motivation	1.133	.074	.751	15.264	<0.001**

Adjusted R^2= 0.756 P = <0.001**

*(B) Beta Co-Efficient (SEB) Standard Error * Statistically significant p ≤ 0.05 yhlw34io\=*

Table (1): Reveals that 77.6% of studied nursing students were in age group 20- 22 years old with a mean age of 21.41 ± 0.49 years, 54.4% of them were female; Concerning the residence, 86.4% of them lived in urban areas. Furthermore, 36.4% and 38.8% from studied nursing students' fathers had high level of education and secondary education respectively and 94.4% of them didn't have membership of environmental organization.

Table (2): Reports that there was highly statistically significant difference between mean scores of all items of the proenvironmental behavior of studied nursing students' at pre application of protection motivational theory and post application of protection motivational theory phases with (p- value ≤0.001).

Figure (1): Illustrates that 58.4 % of studied nursing students had positive behavior regarding pro environmental behaviorpre protection motivational theory application and then raised to 83.2% post protection motivational theory application

Table (3): States that there was highly statistically significant difference between mean scores of all items of the protection motivation domains of studied nursing students' at pre and post theory application phases with (p- value ≤0.001). The total mean score of theory application of studied nursing students was raised from 71.29 ± 6.82 in pre theory application to 81.55 ± 9.45 in post theory application.

Table (4): Explains that there was statistically significant correlation between total pro environmental behavior and protection motivation domains pre theory application (P≤0.05) and there was highly statistically significant correlation between total pro environmental behavior and protection motivation domains post theory application (P≤0.001).

Table (5): Multivariate linear regression model in this table reveals that pro environmental behavior score post theory application among studied nursing students was best predicted by protection motivation , residence, membership of environmental organization (p= <0.001**) and mothers' level of education (p= 0.030*), accounting for 75.6 % of the variance of behavior score.

Discussion:

Promoting pro-environmental behavior is critical for achieving sustainable development, addressing environmental issues, and improving quality of life. Engaging in pro-environmental behavior positively affects individual well-being so individuals who participate in pro-environmental behaviors such as recycling or minimizing energy consumption experience higher levels of health and well-being including improved physical health, mental well-being, and overall life satisfaction. The PMT is one idea that explains pro-environmental behavior. Individual motives for engaging in pro-environmental activities may be described using PMT, **(May & Nastiti, 2022 & Purnama et aL., 2024).**

The aim of this study was to examine the improvement of the pro-environmental behavior of nursing students based on protection motivation theory. It confirmed the research hypothesis as Using the framework of the protection motivation theory is effective in improving pro-environmental behavior of nursing students.

Regarding to demographic characteristics of studied nursing students, this study showed that; more than half of them were female **(table 1)**, These findings were in agreed with **Purnamaet aL., (2024)** who studied Pro-environmental behavior to improve the quality of life with social value orientation as moderator at Jenderal Achmad Yani University in Indonesia, 402 students participated and stated that male students = 99 people (24.63%) (mean age = 20.49 years, SD = 1.42), and female students (75.37%) (mean age = 20.48 years, SD = 1.42). From the researcher point of view females are more interested to foster bond with nature and possess a high level of concern for the environment than males. In Egypt Females tend to recycle more because they are often primarily responsible for managing household tasks, including waste disposal make them aware of the importance of recycling and managing waste properly also their concern for health and hygiene of their homes may lead them to keep the environmental cleaner, so they have a smaller carbon footprint, and more committed to the sustainable lifestyle as compared to the male counterparts because male afraid of being branded as feminine for doing sustainable behavior. The fear is based on a psychological fear derived from social stigma.

Regarding Membership of environmental organization, the present study showed that minority of studied students was member of environmental organization. This result in the same line with **Shafiei & Maleksaeidi (2020),** who studied Pro-environmental behavior of university students: Application of protection motivation theory in Iran (n) = 310 Iranian students and pointed out that only 10 respondents (3.3%) were members of the environmental organizations. This attributed to several factors may contribute to this low participation. Firstly, a lack of awareness about the existence and role of such organizations may hinder students from seeking membership. Furthermore, Time constraints due to the demanding nature of nursing education may also limit students' availability to participate in extracurricular activities. In addition, the absence of accessible environmental groups may reduce opportunities for involvement. Low perceived self-efficacy could further discourage students who believe their individual efforts would not result in meaningful environmental change. These findings suggest a need for targeted strategies to enhance student engagement in environmental organizations, including awareness campaigns, integrating environmental issues into nursing education, and creating accessible, student-led environmental groups within nursing schools.

In accordance to the studied nursing students' mean score of pro environmental behavior pre and post protection motivational theory application, The present study showed that there was highly statistically significant difference between mean scores of all items of the pro environmental behaviorof studied nursing students' at pre application of protection motivational theory and post application of protection motivational theory phases with (p- value ≤0.001) **(table 2).** This result disagreed with **May & Nastiti, (2022),**Who studied Pro-environmental Behaviours and Protection Motivation Theory: 363 Indonesian university students participated in A Case of Two Universities in Bandung, Indonesia, and it was discovered that pro-environmental behavior is directly and significantly correlated with environmental attitude, self-efficacy, response costs, intrinsic and extrinsic rewards from maladaptive behavior to the environment, and respondents' perceived severity. Furthermore, the degree of perceived severity of perceived vulnerability indirectly influences pro-environmental behaviour.

From the researcher point of view, the structured PMT framework likely enhanced students' perceived severity and vulnerability by clearly linking

environmental degradation to health outcomes, making the threat more personally relevant and urgent. Additionally, the intervention probably increased response efficacy, showing students that their individual actions—such as waste reduction or energy conservation can have a real impact. The program may also have improved self-efficacy through skill-building activities and practical guidance, empowering students to adopt and maintain eco-friendly behaviors confidently. Furthermore, reducing perceived response costs by addressing common barriers and demonstrating low-effort, cost-effective environmental actions may have encouraged greater behavioral adoption. Social modeling, group discussions, and peer engagement likely reinforced positive norms and motivated students further. Collectively, these mechanisms underpinning PMT contributed to a more informed, motivated, and confident student population, this finding suggests the need to formally integrate environmental health and sustainability topics into the curriculum, not merely as optional content but as core competencies aligned with holistic patient care.

As regards to the **total level of pro environmental behavior pre and post protection motivational theory application,** The present study illustrated that slightly less than fifth of studied nursing students' had positive behavior regarding pro environmental behavior pre protection motivational theory application and then raised to majority post protection motivational theory application **(figure 1).** From the researcher point of view this finding highlights the effectiveness of PMT in promoting sustainable behaviors by targeting students' cognitive and emotional responses to environmental threats. By increasing awareness of environmental risks, enhancing perceived ability to make a difference, and reducing barriers to action, the intervention successfully motivated students to adopt more responsible environmental behaviors. These findings support the integration of PMT-based strategies into nursing education as a powerful approach to fostering environmentally conscious healthcare professionals.

In Accordance of mean score of protection motivation theory items pre and post program application, The present study reveals that there was highly statistically significant difference between mean scores of all items of the protection motivation domains of studied nursing students' at pre theory application and post theory application phases with (p- value ≤0.001)(table 3). The findings of this study provide strong evidence supporting the effectiveness of applying PMT to improve pro-environmental behavior among nursing students. This result confirmed with **Kowalski & Black (2021),** who studied Protection Motivation and the COVID-19 Virus n= 424 respondents and reported that perceived severity and outcome officiousness had statistically significant and correlating positively with frequency.

From a theoretical perspective, this change reflects the effectiveness of the PMT framework in influencing both the threat appraisal (perceived severity and vulnerability) and coping appraisal (response efficacy, self-efficacy, and response cost) among nursing students. The intervention likely helped students to internalize the relevance of environmental issues to their future professional roles, while also empowering them with the belief that their individual actions can contribute to positive change. Additionally, the significant rise in scores may suggest that the educational strategies employed successfully translated abstract environmental threats into personal, actionable responsibilities. This enhancement in motivational domains is critical, as it serves as a precursor to actual behavior change. The results affirm the utility of PMT-based interventions as a foundation for educational programs aiming to foster sustainable mindsets and habits among healthcare students, ensuring that future nurses are both environmentally conscious and capable of influencing green practices within clinical settings. This will trigger students to protect the environment to be sustainable. Motivation and campaigns should be performed to increase awareness and positive behavior of students.

Regarding the **Correlation coefficient between nursing students' total pro environmental behavior and Protection motivation domains pre and post theory application,**The present study showed that there was highly statistically significant positive correlation between total pro environmental behavior and protection motivation domains post theory application (P≤0.001) **(table 4)**. This result confirmed with **Rainear & Christensen (2017),** who studied Protection motivation theory as an explanatory framework for pro environmental behavioral intentions , in the United States (n) = 607 university students and demonstrated that this study makes a significant contribution to the literature by providing evidence of PMT as a promising explanatory framework for pro environmental behavioral intentions.From the researcher point of viewaccording to PMT, people engage in PEB when perceive a serious environmental threat and believe that actions can help mitigate it. The highly statistically significant positive correlation also can be attributed to the strong alignment between the motivational constructs of the theory and actual behavior change. As the intervention enhanced students' perceptions of environmental threat (severity and vulnerability) and improved their coping appraisals (response efficacy and self-efficacy), their

likelihood of engaging in pro-environmental actions increased correspondingly. Additionally, the reduction of perceived response costs made sustainable behavior more accessible and realistic for students. The comprehensive nature of the PMT-based approach—combining cognitive, emotional, and practical elements—likely fostered deeper engagement, resulting in both increased motivation and behavioral adoption. This direct relationship between improved motivational factors and behavioral outcomes underscores the effectiveness of PMT in guiding nursing students toward sustainable environmental practices.

Accordance the Multivariate linear regression model, the study reveals that pro environmental behavior score post theory application among studied nursing students was no predicted by age and gender **(table 5)**, result agreement with **Thondhlana & Hlatshwayo (2018),** who studied Pro-environmental behavior in student residences at Rhodes University, South Africa n= 160 students and found that there is no significant between gender, age and year of study of students with pro environmental behavior**. From the researchers' perspective,** the lack of a significant predictive relationship between age or gender and pro-environmental behavior post-application of Protection Motivation Theory may be attributed to the uniform impact of the intervention across all student groups. The structured educational program likely influenced students' motivation and behavior equally, regardless of demographic differences. Additionally, the shared academic environment, limited age variation, and strong emphasis on cognitive factors like self-efficacy and threat perception may have minimized the influence of personal characteristics. This suggests that professional identity and theory-driven motivation played a more decisive role than age or gender in shaping environmental behavior.

Conclusion:

The findings concluded that using protection motivation theory is an effective method and plays a vital role at inducing a significant change for improving pro-environmental behavior of nursing students .

Recommendations:

- Continuous implementation of protection motivation theory for achieving pro-environmental behavior sustainability.
- Integrate Environmental Education into Nursing Curricula
- Future researchers can utilize this theory as a foundation for examining the pro-environmental behaviors of various social groups and gaining insights into the factors that affect these behaviors.
- Regular seminars, simulations, and awareness campaigns should be organized to reinforce pro-environmental behaviors and maintain student engagement beyond a one-time intervention.
- Establish and Promote Student-Led Environmental Groups.

References

Balla, J., & Hagger, M. (2024): Protection motivation theory and health behaviour: conceptual review, discussion of limitations, and recommendations for best practice and future research. Health Psychology Review, 1-27.https://doi.org/10.1080/17437199.2024.2413011.

Berger, S., & Wyss, M. (2021): Measuring pro-environmental behavior using the carbon emission task. J. Environ. Psychol. 2021, 75, 101–613.

Colombo, L., Chiarella, G., Lefrançois, C., Fradin, J., Simione, L., & Raffone, A. (2023): Probing pro-environmental behaviour: A systematic review on its relationship with executive functions and self-regulation processes. Journal of Environmental Psychology, 92, 102153.

Dioba, A., Kroker, V., Dewitte, S., & Lange, F. (2024): Barriers to pro-environmental behavior change: A review of qualitative research. Sustainability, 16(20), 8776.

Gómez, P., Almroth, C., Eriksen, M., Ryberg, M., and Cornell, E. (2024): Plastics pollution exacerbates the impacts of all planetary boundaries. One Earth, 7(12), 2119-2138.

Jans, L. (2021): Changing environmental behaviour from the bottom up: The formation of pro-environmental social identities. Journal of Environmental Psychology. 73. 101531.

Kothe, J., Ling, M., North, M., Klas, A., Mullan, A., & Novoradovskaya, L. (2019): Protection motivation theory and pro-environmental behaviour: A systematic mapping review. Australian Journal of Psychology, 71(4), 411-432.

Kowalski, R., & Black, K. (2021): Protection **motivation** and the COVID-19 virus. Health communication, 36(1), 15-22.

Liu, J., & Green, J. (2024): Children's pro-environmental behaviour: A systematic review of the literature. Resources, Conservation and Recycling, 205, 107-524.

Luque-Alcaraz, M., Aparicio, P., Gomera, A., & Vaquero-Abellán, M. (2024): The environmental awareness of nurses as environmentally sustainable health care leaders: a mixed method analysis. BMC nursing. 23(1). 229.

Marikyan, D., & Papagiannidis, S. (2023): Protection motivation theory: A review**.** TheoryHub Book: This handbook is based on the online theory resource: TheoryHub. 78-93.

May, A., & Nastiti, A. (2022): Pro-environmental Behaviours and Protection Motivation Theory: A Case of Two Universities in Bandung, Indonesia Perilaku Pro-lingkungan dan Teori Proyeksi Motivasi: Studi Kasus Dua **Universitas** di Bandung, Indonesia.Jurnal Teknik Lingkungan 28(1):42-55

Organization for Economic Co-operation and Development OECD (2024): OECD Green Growth Policy Review of Egypt 2024, OECD Environmental Performance Reviews, **OECD** Publishing, Paris, https://doi.org/10.1787/b9096cec-en.

Presidency, (2025): Go green initiative, available at https://www.presidency.eg/en/%D8%A7%D9%84%D8%B1%D8%A6%D8%A7%D8%B3%D8%A9/%D9%85%D8%A8%D8%A7%D8%AF%D8%B1%D8%A9-%D8%A7%D8%AA%D8%AD%D8%B6%D8%B1-%D9%84%D9%**84**%D8%A3%D8%AE%D8%B6%D8%B1/#:~:text=The%20initiative%20is%20launched%20as,marine%20life%20to%20maintain%20sustainability.

Purnama, C., Srisayekti, W., Fitriana, E., & Djunaidi, A. (2024): Pro-environmental behavior to improve the quality of life with social value orientation as moderator: findings from Indonesia. International Journal of Environmental Health Research, 1-20.

Rainear, A., & Christensen, J. (2017): Protection motivation theory as an explanatory framework for proenvironmental behavioral intentions. Communication Research Reports, 34(3), 239-248.

Shafiei, A., & Maleksaeidi, H. (2020): Pro-environmental behavior of university students: **Application of** protection motivation theory. Global Ecology and Conservation, 22, e00908.

Tian, H., & Liu, X. (2022): Pro-environmental behavior research: Theoretical progress and future directions. International journal of environmental research and public health, 19(11), 6721

Thondhlana, G., & Hlatshwayo, T. (2018): Pro-environmental behaviour in student residences at Rhodes University, South Africa. Sustainability, 10(8), 2746.

Udall, M., de Groot, I., de Jong, B., & Shankar, A. (2020): How do I see myself? A systematic review of identities in pro-**environmental** behaviour research. Journal of Consumer Behaviour. 19(2). 108-141.

Yezid S., Olivia L., Yasmine H., Nadine W., Justin D., & Arafat N. (2023): Meeting Egypt's Environmental Challenges. https://**carnegieendowment**.org/middle-east?lang=en Published on December 5, 2023

Yusliza, Y., Amirudin, A., Rahadi, A., Nik, A., Ramayah, T., Muhammad, Z., & Mokhlis, S. (2020): An investigation of pro-environmental **behaviour** and sustainable development in Malaysia. Sustainability. 12(17). 70-83.