A Health Literacy Model for Healthy Eating, Emotional Health, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province

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Abstract

This research aimed to: 1) examine the current status of health literacy development in promoting eating behavior, emotional management, and exercise among Village Health Volunteers (VHVs) in Bang Yai District, Nonthaburi Province; 2) analyze factors influencing health-promoting behaviors in these three dimensions; and 3) propose a model for health literacy development to enhance health promotion practices among VHVs.

This study employed a descriptive research design. The population consisted of 210 Village Health Volunteers who attended the annual VHV meeting in 2024. The sample size was determined using Taro Yamane's formula, yielding 140 participants. Data were collected using a structured questionnaire comprising three parts: personal characteristics; management processes for health literacy development based on the PDCA cycle (Plan–Do–Check–Act) with 16 items; and health literacy behaviors in promoting eating, emotional health, and exercise based on the V-SHAPE framework (Access, Understand, Interact/Exchange, Decide, Change Behavior, Share/Empower) with 12 items. The instrument demonstrated content validity (IOC = 0.67–1.00) and high reliability (Cronbach's alpha = 0.95). Data were collected from January 1–31, 2025, with a response rate of 100 percent. Data were analyzed using descriptive statistics (percentage, mean, standard deviation) and inferential statistics including multiple regression analysis.

The findings revealed that the overall management process for health literacy development was at a moderate level ($\bar{x}$ = 3.21, S.D. = .52). Among the PDCA components, the "Act" dimension (continuous improvement) showed the highest mean score at a high level ($\bar{x}$ = 3.75, S.D. = .41), while the "Check" dimension ranked lowest but remained at a moderate level. Regarding health literacy behaviors based on the V-

SHAPE framework, the overall level was moderate ($\bar{x}$ = 2.54, S.D. = .63). The highest mean was found in the Access dimension, followed by Interact/Exchange, whereas Share/Empower had the lowest mean score.

Multiple regression analysis indicated that the "Check" (B = .58, Beta = .492, p < .001) and "Act" (B = .34, Beta = .224, p = .005) components significantly predicted health literacy behaviors. The model demonstrated a multiple correlation coefficient (R) of .65 and an adjusted R^2 of .42, indicating that management processes explained 42 percent of the variance in health literacy promotion behaviors. The predictive equation in raw score form was: $\hat{Y}$ = .59 + (.58 Check) + (.34 Act).

The results suggest that systematic monitoring and continuous improvement mechanisms are critical determinants in strengthening health literacy behaviors among VHVs. Therefore, an effective model for health literacy development should emphasize evaluation, reflective practice, and sustainable improvement processes to enhance eating behavior, emotional well-being, and exercise promotion at the community level.

Keywords: Health Literacy Model, PDCA Management Process, Village Health Volunteers, Eating Behavior, Emotional Health, Exercise Promotion

Background and Statement of the problem

Health promotion is a fundamental strategy of modern health systems aimed at empowering individuals to effectively control and sustainably improve their own health status. It encompasses essential dimensions of health behavior, including appropriate dietary practices, adequate physical activity, and balanced mental and emotional well-being. These three components constitute key health determinants that are directly associated with population health outcomes and quality of life. The World Health Organization and the Ministry of Public Health have emphasized that proper nutritional consumption, regular exercise, and appropriate emotional management are critical mechanisms for preventing non-communicable diseases (NCDs) and enhancing health well-being across the life course. In this regard, the Department of Health, Ministry of Public Health, has established strategic guidelines for promoting health behaviors through the development of health literacy, enabling individuals to access, understand,

analyze, evaluate, and appropriately apply health information within their specific contexts. This approach serves as a foundational framework for proactive community-based health system development (Department of Health, 2022).

However, the current health situation of the Thai population reflects persistent challenges in sustaining appropriate health-promoting behaviors. A substantial proportion of Thai people continue to engage in unhealthy dietary practices, including excessive consumption of sugar, fat, and sodium beyond recommended standards, insufficient levels of physical activity, and increasing exposure to stress and mental health problems. Data from the National Health Examination Survey (NHES) and reports from the Division of Non-Communicable Diseases, Department of Disease Control, indicate that more than 25 percent of the Thai population has insufficient physical activity levels and consumes fruits and vegetables below recommended guidelines. Furthermore, rising trends in stress and depressive symptoms have been observed. These findings reflect limitations in health literacy and in the behavioral management capacity of the population (Department of Disease Control, 2023).

The V-SHAPE Health Literacy Framework, developed by the Department of Health, Ministry of Public Health, represents a significant conceptual model for enhancing individuals' capacity to manage their own health effectively. The framework comprises essential processes including Access to health information, Understand, Interact, Decide, Change behavior, and Share. These processes are interconnected with the development of cognitive skills, social skills, and self-management competencies in a systematic manner. The integration of this framework with the PDCA management cycle (Plan–Do–Check–Act) facilitates systematic health promotion operations through structured planning, implementation, monitoring, evaluation, and continuous improvement. Such integration aligns with quality improvement approaches in area-based health management (Department of Health, 2021).

Village Health Volunteers (VHVs) constitute a crucial mechanism within Thailand's primary health care system, serving as a linkage between health service units and community members. Their roles include disseminating health information, facilitating behavioral modification, and promoting well-being at household and community levels on a continuous basis. Under the "Three Doctors Policy" and the

strengthening of the primary care system, VHVs play essential roles in health screening, nutritional counseling, promotion of physical activity, and mental health support within communities. The effectiveness of these roles depends largely on their level of health literacy and the presence of a structured management system that supports their work. The development of an appropriate health literacy enhancement model would therefore improve both efficiency and effectiveness of health promotion activities at the community level (Division of People's Health Support, 2022).

Simultaneously, the burden of non-communicable diseases in Thailand remains a significant public health concern. The prevalence of diabetes mellitus, hypertension, and obesity has shown a continuous upward trend. Ministry of Public Health data indicate increasing incidence rates of diabetes and hypertension annually, closely associated with inappropriate dietary behaviors, insufficient physical activity, and chronic stress. Overweight and obesity, including abdominal obesity, represent major metabolic risk factors for NCDs and have been steadily increasing among the Thai population. According to the Sixth National Health Examination Survey (2019–2020), 42.2 percent of Thai adults aged 15 years and older were classified as overweight or obese (BMI ≥ 25 kg/m²), with a notably higher prevalence among females. When considering abdominal obesity, defined by waist circumference (≥ 90 cm for males and ≥ 80 cm for females), more than half of Thai adults met the criteria, indicating excessive visceral fat accumulation associated with type 2 diabetes, hypertension, cardiovascular disease, and metabolic syndrome. These trends are strongly related to unhealthy behaviors, including high-energy food consumption, inadequate physical activity, and sedentary behavior, influenced by rapid lifestyle transitions in urban and semi-urban settings. Data from the Department of Health further reveal that abdominal obesity is increasing across all age groups, particularly among working-age adults and the elderly, contributing to long-term healthcare expenditures and diminished quality of life. Therefore, strengthening health literacy mechanisms to modify dietary habits, enhance physical activity, and improve emotional regulation represents a strategic approach to controlling and preventing obesity and abdominal obesity at the community level (Aekplakorn, 2021; Department of Health, 2022).

Nonthaburi Province, located within Health Region 4, represents a semi-urban area undergoing rapid social and lifestyle transformations, thereby increasing population vulnerability to non-communicable diseases. The prevalence of obesity and abdominal obesity in this province exceeds the national average, consistent with epidemiological patterns observed in urbanizing areas contiguous with Bangkok Metropolitan Region. Rapid demographic, economic, and lifestyle changes have shifted dietary patterns toward processed and high-calorie foods, high-fat and high-sodium diets, reduced occupational physical activity in service and industrial sectors, and increased sedentary behavior associated with digital technology use. These factors collectively contribute to an obesogenic and unhealthy food environment.

Given the significance of these public health challenges, investigating a health literacy development model to promote healthy eating, exercise, and emotional management among Village Health Volunteers in Bang Yai District, Nonthaburi Province, is critically important. Such a study enables the identification of current operational conditions, personal characteristics, and PDCA-based management processes influencing health literacy behaviors. The findings can inform the development of an effective, context-specific operational model that may serve as a prototype for sustainable community-based health promotion systems, ultimately supporting national goals for reducing non-communicable diseases and improving population quality of life in the long term.

Objective

1. To examine the current status of health literacy development in promoting healthy eating, physical activity, and emotional well-being among Village Health Volunteers in Bang Yai District, Nonthaburi Province.
2. To analyze factors influencing health-promoting behaviors related to dietary practices, emotional management, and physical activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province.
3. To propose a health literacy development model for promoting healthy eating, physical activity, and emotional well-being among Village Health Volunteers in Bang Yai District, Nonthaburi Province.

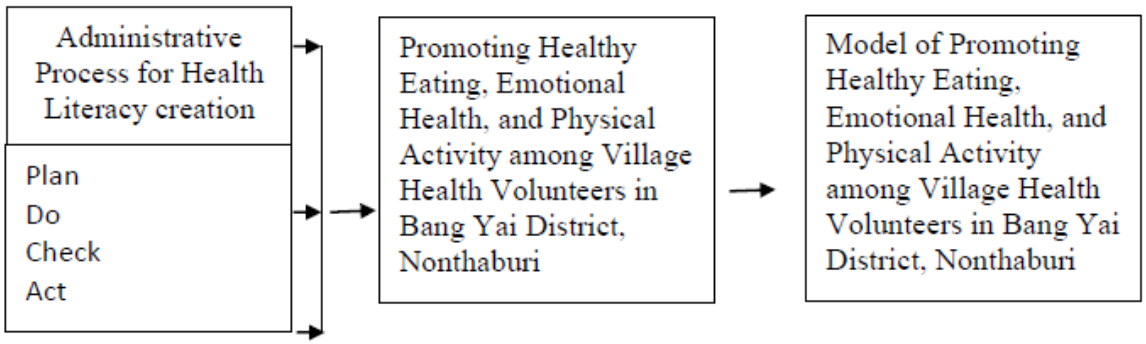
Expected benefits

1. Obtain empirical data regarding the current status of health literacy development in promoting healthy eating, physical activity, and emotional well-being among Village Health Volunteers in Bang Yai District, Nonthaburi Province.

2. determine the key predictive factors influencing health-promoting behaviors related to dietary practices, emotional management, and physical activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province.

3. develop a context-specific health literacy model for promoting healthy eating, physical activity, and emotional well-being among Village Health Volunteers in Bang Yai District, Nonthaburi Province.

Conceptual Framework



Research Methodology

This research entitled "A Health Literacy Development Model for Promoting Healthy Eating, Emotional Well-being, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province" employed a descriptive research design. Data were collected through a structured questionnaire. The research methodology is detailed as follows:

Population

The population consisted of 210 Village Health Volunteers in Bang Yai District, Nonthaburi Province, who attended the annual Village Health Volunteer meeting in 2024. The sample size was determined using Taro Yamane's formula, resulting in a sample of 140 participants. A simple random sampling technique was employed to select participants from the list of eligible VHVs attending the meeting. This method was

chosen to ensure that each individual had an equal chance of selection, thereby reducing selection bias and enhancing the representativeness of the sample.

The selected sample was considered representative of VHVs in the district, as participants were drawn from all sub-districts and shared similar roles and responsibilities within the primary healthcare system.

However, this study has some limitations. Since participants were recruited from those attending the annual meeting, VHVs who were absent may differ in characteristics such as motivation or health behaviors. Therefore, the generalizability of the findings to all VHVs in the district or other settings should be interpreted with caution.

Research Instrument

The research instrument was a structured questionnaire comprising three sections.

Part1collected demographic information of respondents. Part 2 assessed the current status of management processes for health literacy development in promoting healthy eating, emotional well-being, and physical activity among Village Health Volunteers. This section included 16 items covering the PDCA management cycle: planning, implementation, monitoring (checking), and improvement (acting).Part 3 assessed health literacy behaviors in promoting healthy eating, emotional well-being, and physical activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province, consisting of 12 items.

Instrument Validation and Reliability

Content validity was examined using the Index of Item-Objective Congruence (IOC), yielding values ranging from 0.67 to 1.00. Reliability analysis demonstrated a high internal consistency with a Cronbach's alpha coefficient of 0.95

Data Collection

Data were collected through questionnaire administration between January 1–31, 2025. A total of 140 completed questionnaires were returned, representing a 100 percent response rate.

Data Analysis

Data were analyzed using descriptive statistics, including percentage, mean, and standard deviation. Inferential statistics were employed, including multiple regression analysis.

Classification Criteria

The levels of management processes for health literacy development and health literacy behaviors were categorized into three levels: high, moderate, and low.

Research Results

The findings of this study are presented according to the research objectives as follows:

1. Personal Characteristics of the Respondents

The demographic characteristics of the Village Health Volunteers who participated as respondents can be described as follows: The majority of respondents were female (62.1%). Most were aged between 41–50 years (40.7%). Regarding work experience, 50.7% had more than 15 years of service as Village Health Volunteers.

2. Management Processes for Health Literacy Development in Promoting Healthy Eating, Emotional Well-being, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province

In this section, data were analyzed and presented regarding the management processes supporting health promotion and disease prevention in the areas of dietary practices, emotional well-being, and physical activity among Village Health Volunteers. The management processes were structured according to the PDCA cycle, including planning, implementation, monitoring (checking), and improvement (acting). The interpretation of management process levels was categorized into three levels: high, moderate, and low. Additionally, each component was ranked according to its mean score from highest to lowest performance level.

Table 1 shows the average standard deviation and the ranked of each management aspect and overall process for health literacy creation for Promoting Healthy Eating, Emotional Health, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi

Evaluation list	Evaluation			
	$\overline{X}$	S.D	Results	Ranked
1. Plan	3.28	0.57	Moderate	2
2. Do	3.24	0.59	Moderate	3
3. Check	3.13	0.53	Moderate	4
4. Act	3.75	0.41	high	1
5. Overall	3.21	0.52	Moderate	

Table 2 shows the average standard deviation and the ranked of each management items for health literacy creation for Promoting Healthy Eating, Emotional Health, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi

Evaluation list	Evaluation			
	$\overline{X}$	S.D	Results	Ranked
1. Plan				
Assessment of health problems and needs prior to activity implementation	3.42	0.67	Moderate	4
Situation analysis (strengths, weaknesses, opportunities, and threats) in implementation	2.90	0.75	Moderate	15
1. Plan				
Establishment of health objectives and operational plans	3.26	0.66	Moderate	8
Target group participation in planning health activities	3.53	0.76	High	3
2.Do				
Allocation of roles and responsibilities in implementation	3.22	0.83	Moderate	9
Provision of health education activities according to the established plan	3.30	0.60	Moderate	6
Utilization of appropriate learning media and methods for the target group	3.16	0.82	Moderate	12
Participants' engagement in hands-on practice for self-health management	3.29	0.57	Moderate	7
3.Check				
Monitoring implementation according to the specified timeline	3.33	0.58	Moderate	5
Ongoing evaluation during implementation	3.21	0.66	Moderate	10
Post-activity evaluation of health knowledge or behaviors	2.84	.66	Moderate	16
Joint reflection on operational outcomes between organizers and participants	3.11	0.60	Moderate	13
4.Act				
Summary meeting of operational outcomes	3.18	0.60	Moderate	11
Adjustment of activity formats based on evaluation results	3.06	0.87	Moderate	14
Expansion of health activities in the subsequent fiscal year	4.25	0.74	High	2
Development of sustainable health operational guidelines	4.52	0.63	High	1

3. Health-Promoting Behaviors Related to Healthy Eating, Emotional Well-being, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province

In this section, the researcher analyzed and presented the management processes supporting health promotion and disease prevention in the areas of dietary practices, emotional well-being, and physical activity among Village Health Volunteers. These processes were examined according to the V-SHAPE health literacy framework, comprising Access, Understand, Interact/Exchange, Decide, Change Behavior, and Share/Empower.

The interpretation of health literacy development levels was categorized into three levels: high, moderate, and low. Each component was ranked according to its mean score from highest to lowest performance level, as presented in Tables 3 and 4.

Table 3 shows the average standard deviation and the ranked of Promoting Healthy Eating, Emotional Health, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi

Evaluation list	Evaluation			
	$\overline{X}$	S.D	Results	Ranked
1. Access	2.65	0.61	Moderate	1
2. Understand	2.54	0.63	Moderate	3
3. Interact / Exchange	2.60	0.64	Moderate	2
4. Decide	2.53	0.65	Moderate	4
5. Change Behavior	2.51	0.63	Moderate	5
6. Share / Empower	2.47	0.62	Moderate	6
Overall	2.54	0.63	Moderate	

Table 4 shows the average standard deviation and the ranked of the items of Promoting Healthy Eating, Emotional Health, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi

Evaluation list	Evaluation			
	$\overline{X}$	S.D	Results	Ranked
1. Access				
Ability to obtain health information from reliable sources	2.51	0.68	Moderate	8
Adequate access to health information channels	2.66	0,61	Moderate	2
2. Understand				
Understanding health information received from activities/media	2.56	0.63	Moderate	5
Ability to correctly follow health recommendations	2.46	0.66	Moderate	10
3. Interact / Exchange				
Asking questions when health information is unclear	2.56	0.64	Moderate	4
Participation in exchanging health-related ideas within the group	2.69	0.46	Moderate	1
4. Decide				
Evaluating the credibility of health information before making decisions	2.53	0.65	Moderate	6
4. Decide				
Making appropriate health behavior decisions suitable for oneself	2.49	0.65	Moderate	9
5.Change Behavior				
Applying health knowledge consistently in daily life	2.58	0.49	Moderate	3
Ability to modify health risk behaviors	2.51	0.63	Moderate	7
6. Share / Empower				
Disseminating health knowledge to family or community members	2.45	0.63	Moderate	11
Confidence in serving as a health role model to encourage appropriate behavior change	2.43	0.63	Moderate	12

4. Factors Influencing Health-Promoting Behaviors Related to Healthy Eating, Emotional Well-being, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province

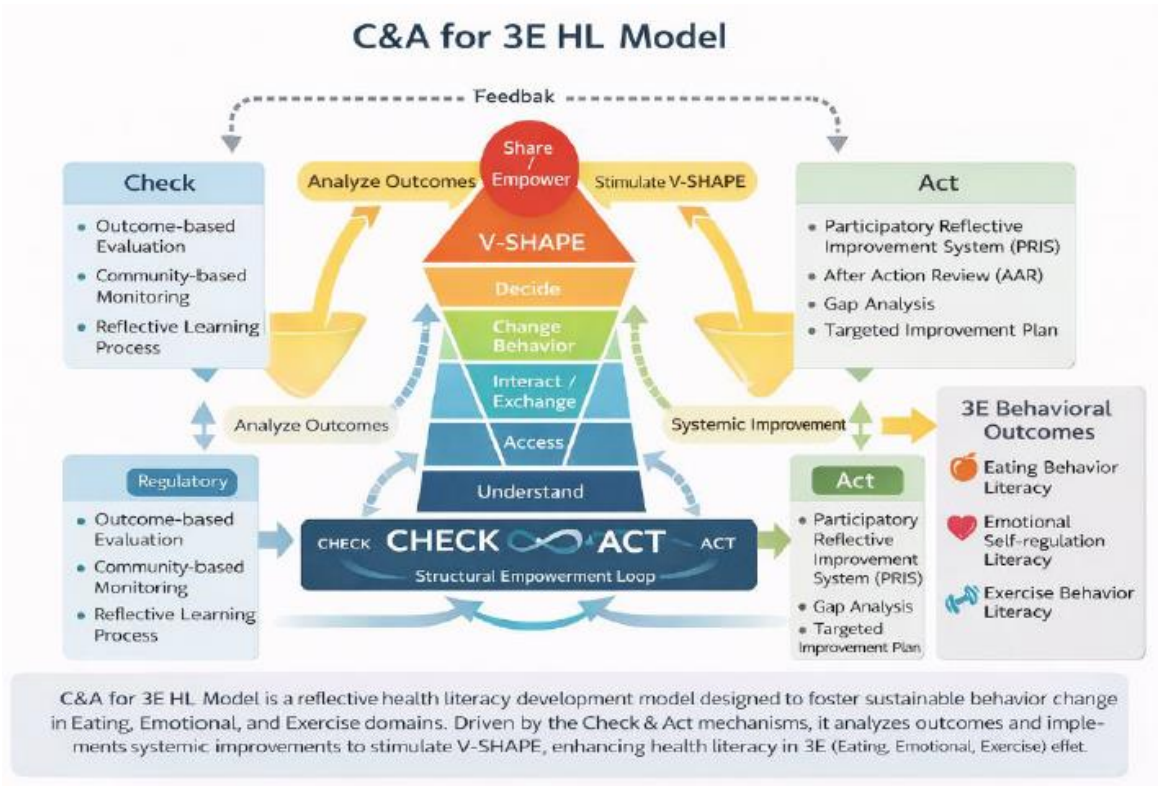
In this phase, inferential statistical analysis was conducted to examine the predictive factors related to management processes for health literacy development and health-promoting behaviors in the domains of dietary practices, emotional well-being, and physical activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province. The results of regression analyses are presented in Table 5.

Table 5 shows the Multiple Regression Analysis Predicting Health-Promoting Behaviors (Eating, Emotional Well-being, and Physical Activity)

Predictor	Promoting Healthy Eating, Emotional Health, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi			
	B	S.E.b	Beta	Sig
Check	.58	.09	.492	.000
Act	.34	.12	.224	.005
Constant	.59	.38		.135
R	.65			
R^2 adj	.42			

Multiple regression analysis indicated that the Check (B = 0.58, SE = 0.09, Beta = 0.492, p < .001) and Act (B = 0.34, SE = 0.12, Beta = 0.224, p = .005) components significantly predicted health-promoting behaviors. The model explained 42% of the variance (Adjusted R^2 = 0.42) with a multiple correlation coefficient of 0.65.The predictive equation in raw score form was: $\hat{Y}$ = 0.59 + (0.58 × Check) + (0.34 × Act)

5. A Health Literacy Development Model for Promoting Healthy Eating, Physical Activity, and Emotional Well-being among Village Health Volunteers in Bang Yai District, Nonthaburi Province



The proposed model, termed the "C&A for 3E Health Literacy Model," was empirically derived from multiple regression analysis, in which healthy eating, emotional health, and physical activity emerged as significant outcome variables (3E). These components represent the core domains of health behavior targeted in this study. Furthermore, the model incorporates management principles, particularly the "Check" and "Act" phases of the PDCA cycle, as key operational mechanisms. These processes emphasize ongoing monitoring, evaluation, and adaptive improvement, ensuring that health literacy interventions are responsive and sustainable within the context of Village Health Volunteers.

Summary of Research Findings

Current Status of Management Processes for Health Literacy Development in Promoting Healthy Eating, Emotional Well-being, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province

The analysis of management processes based on the PDCA framework indicated that the overall level was moderate. When examined by component, the Act

dimension demonstrated the highest mean score at a high level and ranked first, reflecting that the sample group systematically applied evaluation findings to continuously improve and develop operational performance. This was followed by the Plan component at a moderate level (ranked second), the Do component at a moderate level (ranked third), and the Check component, which showed the lowest mean score yet remained within the moderate level (ranked fourth).

These findings indicate that although the overall management process was at a moderate level, greater strength was observed in the improvement phase compared with other stages. In contrast, the monitoring and evaluation phase requires further strengthening to ensure that the PDCA cycle operates comprehensively and achieves optimal effectiveness.

At the item level, most activities were rated at a moderate level. The highest mean score was observed for "Development of sustainable health operational guidelines" (ranked first), followed by "Expansion of health promotion activities in the subsequent fiscal year" (ranked second), and "Target group participation in planning health activities" (ranked third). These results reflect strong performance in continuous improvement and community participation.

Conversely, the lowest mean scores were found in "Post-activity evaluation of health knowledge or behaviors" (ranked sixteenth) and "Situation analysis including strengths, weaknesses, opportunities, and threats" (ranked fifteenth). Although these items remained at a moderate level, they were comparatively lower than others, indicating that situational analysis and systematic evaluation processes require further development. Overall, the findings highlight that the Act phase is the most prominent component, whereas the Check phase and aspects of the Plan phase represent areas requiring reinforcement to ensure a complete and effective PDCA management cycle capable of sustaining community health outcomes. The proposed "C&A for 3E Health Literacy Model" extends existing frameworks by combining three behavioral domains (healthy eating, emotional health, and physical activity) with continuous monitoring and improvement processes.

Current Status of Health Literacy Development in Promoting Healthy Eating, Emotional Well-being, and Physical Activity among Village Health Volunteers in Bang Yai District, Nonthaburi Province

The analysis of health literacy behaviors based on the V-SHAPE framework indicated that the overall level was moderate. Among the dimensions, Access ranked highest, followed by Interact/Exchange and Understand. The lowest mean scores were observed in Share/Empower, followed by Change Behavior and Decide.

These findings suggest that while respondents demonstrated the ability to access health information and engage in knowledge exchange to a certain extent, progression toward decision-making, sustained behavioral modification, and empowerment for knowledge dissemination remains relatively limited. This pattern indicates the need to strengthen mechanisms that facilitate the transition from information awareness to practical application and community-level expansion.

At the item level, all indicators were rated at a moderate level. The highest mean score was observed in "Participation in health-related discussions within the group" (ranked first), followed by "Adequate access to health information channels" (ranked second), and "Consistent application of health knowledge in daily life" (ranked third).

In contrast, the lowest mean scores were found in "Confidence in serving as a health role model to encourage appropriate behavior change" (ranked twelfth) and "Dissemination of health knowledge to family or community members" (ranked eleventh). These findings indicate that the Share/Empower dimension remains comparatively weaker than other components. Overall, while participants demonstrated moderate competence in access and participation, advancement toward sustained behavior change and community empowerment was less evident, underscoring the need to develop supportive mechanisms that enable Village Health Volunteers to become sustainable community health change agents.

Analysis of Management Factors Influencing Health Literacy Behaviors

Multiple regression analysis revealed that the Check and Act components of the management process significantly predicted health literacy behaviors related to healthy eating, emotional well-being, and physical activity at the .05 significance level.

The Check component showed a statistically significant positive influence (B = .58, S.E. = .09, Beta = .492, p < .001), indicating that enhanced monitoring, supervision, and evaluation were associated with significant increases in health literacy behaviors and represented the strongest predictor in the model.

Similarly, the Act component demonstrated a statistically significant positive effect (B = .34, S.E. = .12, Beta = .224, p = .005), suggesting that the systematic application of evaluation findings for continuous improvement contributes to enhanced health literacy behaviors.

The multiple correlation coefficient (R) was .65, indicating a relatively strong relationship between independent and dependent variables. The adjusted R^2 value of .42 indicates that management process variables explained 42% of the variance in health literacy behaviors, representing a moderate to moderately high explanatory power for research in social and public health sciences.

Discussion

The findings of this study on "A Health Literacy Development Model for Promoting Healthy Eating, Physical Activity, and Emotional Well-being among Village Health Volunteers in Bang Yai District, Nonthaburi Province" can be discussed according to the research objectives as follows.

First, the PDCA-based management processes were overall at a moderate level. Notably, the Check and Act components significantly predicted health literacy behaviors and accounted for 42% of variance, indicating that monitoring and continuous improvement mechanisms are central to strengthening Village Health Volunteers' systematic learning capacity. These findings align with Deming's quality management cycle, emphasizing evidence-based decision-making and continuous improvement. They are also consistent with Thailand's primary care reform emphasizing results-based monitoring and data-driven management (Ministry of Public Health, 2022).

These findings correspond with Nutbeam (2017), who argued that community health literacy development requires organizational structures that support reflective practice and empowerment processes. Sørensen et al. (2016) further highlighted that health literacy extends beyond individual skills and is shaped by organizational and

systemic contexts. Similarly, studies conducted by the Faculty of Public Health, Mahidol University (2021), found that primary care units with structured monitoring systems demonstrated significantly stronger continuity in Village Health Volunteers' health behaviors.

Second, according to the V-SHAPE framework, Access and Interact/Exchange scored higher than Share/Empower and Change Behavior. This pattern suggests that health literacy among Village Health Volunteers remains predominantly at functional and interactive levels rather than critical and empowerment levels. This aligns with the Department of Health's national health literacy survey (2020), which reported that most Thai citizens demonstrate basic health literacy but lack critical decision-making and empowerment competencies.

Osborne et al. (2016–2020) emphasized that progression from understanding to sustained behavior change requires coaching processes, reflective mechanisms, and social support—elements closely linked to the Check and Act stages of PDCA. The findings thus demonstrate a theoretically coherent structural relationship between management processes and behavioral health literacy outcomes.

Furthermore, research conducted by Chiang Mai University (2019) found that reflective learning platforms and structured community dialogue significantly enhanced Village Health Volunteers' confidence as health leaders, corresponding with the comparatively lower scores observed in the Share/Empower dimension in this study.

In summary, the findings confirm that an effective health literacy development model for Village Health Volunteers should be grounded in systematic PDCA-based management-particularly strengthening monitoring and continuous improvement mechanisms-while simultaneously enhancing critical competencies and empowerment capacities within the V-SHAPE framework. Such integration facilitates progression from information access to sustainable community health leadership. This study demonstrated that health literacy significantly influences healthy eating, emotional health, and physical activity among Village Health Volunteers. These findings highlight the critical role of health literacy in shaping multiple dimensions of health behavior. This relationship may be explained by the functional role of VHVs as key actors in primary healthcare systems. Individuals with higher health literacy are more capable of accessing, understanding, and applying health information, which supports effective decision-making and behavior

modification.These findings are consistent with previous international studies. Don Nutbeam (2017) emphasized that health literacy is a fundamental determinant of health behavior, while Kristine Sørensen et al. (2012) identified health literacy as a multidimensional construct influencing health outcomes.Importantly, this study extends existing knowledge by integrating health literacy with management principles, particularly the Check and Act processes. This approach enhances the sustainability of behavior change by incorporating continuous monitoring and adaptive improvement mechanisms. However, the study has some limitations, particularly regarding the sampling approach, which may limit generalizability. Nevertheless, the findings provide valuable insights for developing effective and sustainable health promotion models in community settings.

Recommendations

Practical Recommendations

Based on the research findings indicating that the PDCA management cycle-particularly the Check and Act components-significantly influenced health literacy behaviors, while the Share/Empower dimension of the V-SHAPE framework remained at a moderate-to-low level, the following practical recommendations are proposed:

1. **Development of a Qualitative Monitoring and Evaluation System**

Evaluation instruments should be developed to assess post-activity outcomes encompassing knowledge levels, decision-making skills, and behavioral changes. Outcome-based Evaluation and Community-based Monitoring approaches should be applied to ensure that the Check stage functions as a reflective learning mechanism rather than merely a documentary reporting process.

2. **Establishment of Structured Reflection and Learning Platforms**

Regular Reflection Forums at the subdistrict or district level should be organized to enable Village Health Volunteers to reflect on operational outcomes, analyze strengths and weaknesses, and collaboratively design improvement strategies. This approach would simultaneously strengthen the Interact and Share/Empower dimensions.

3. **Enhancement of Health Leadership and Empowerment Capacity**

A Health Leadership Development Program should be designed for Village Health Volunteers, emphasizing motivational communication skills, behavioral

role modeling, and community empowerment strategies to elevate the Share/Empower dimension, which represents the culminating stage of the V-SHAPE framework.

4. Establishment of a Participatory Reflective Improvement System (PRIS)

A district-level Participatory Reflective Improvement System should be developed, requiring all health promotion activities conducted by Village Health Volunteers to undergo a three-step process:

1. After Action Review (AAR)
2. Gap Analysis between expected and actual outcomes
3. Development of a Targeted Improvement Plan for the subsequent cycle

5. Integration of PDCA and V-SHAPE in District-Level Planning

The District Health Office should incorporate research findings into strategic planning by integrating PDCA as the management structure and V-SHAPE as the outcome framework, thereby establishing a management system that explicitly links operational processes with behavioral health outcomes.

6. Development of a Mentoring System

A structured mentoring or health coaching system should be implemented for newly recruited Village Health Volunteers, utilizing high-performing volunteers as role models to facilitate tacit knowledge transfer and foster a culture of continuous learning within the community.

7. Utilization of Technology to Support Learning

Digital platforms such as Line Official Accounts or mobile applications should be promoted to enhance continuous access to health information (Access) and ongoing monitoring (Check), particularly in semi-urban contexts with adequate digital infrastructure.

Recommendations for Future Research

To advance theoretical and empirical knowledge in community-based health literacy development, the following research directions are proposed:

1. Experimental or Quasi-Experimental Design

Future studies should employ experimental or quasi-experimental designs to test the PDCA-driven Health Literacy Model developed from this research by comparing intervention and control groups to establish causal inference.

2. Structural Equation Modeling (SEM)

Future research should examine the structural relationships between PDCA and V-SHAPE using Structural Equation Modeling to test causal pathways, including potential mediating variables such as self-efficacy or health leadership.

3. Comparative Studies Across Contexts

Comparative research should be conducted across urban, semi-urban, and rural settings to analyze the influence of socioeconomic and contextual factors on the effectiveness of the proposed model.

4. In-Depth Qualitative Research

Qualitative methodologies such as in-depth interviews or focus group discussions should be employed to explore Village Health Volunteers' experiences, perceptions, and barriers in progressing toward the Share/Empower level.

5. Policy and Systems-Level Research

Further studies should analyze the role of provincial and national policies in strengthening community-level health literacy to bridge research findings with broader health system development.

6. Longitudinal Studies

Long-term follow-up studies should be conducted to assess the sustainability of health behavior changes among Village Health Volunteers and to evaluate the long-term effectiveness of PDCA mechanisms in maintaining outcomes.

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