Performance motivation and Dhammanamai health literacy according to Thai traditional medicine among village health volunteers in Uthaithani province

Wirinya Mueangchang[1] Taweewun Srisookkum[2] Piyavadee Srivichai[2] Narongsuk Munkong[3] Jirawan Chonpratin[4]

[1]Department of Applied Thai Traditional Medicine, School of Public Health, University of Phayao, Phayao, Thailand
[2]School of Public Health, University of Phayao, Phayao, Thailand
[3]School of Medicine, University of Phayao, Phayao, Thailand
[4]Banpraduyuen Queen Sirikit Health Center Uthaithani, Thailand

Corresponding Author: Wirinya Mueangchang Email: wirinya.no@up.ac.th

ABSTRACT

This cross-sectional study aimed to explain levels of Dhammanamai health literacy, investigate relevant factors, and identify the predicting factors of Dhammanamai health literacy according to Thai traditional medicine among village health volunteers (VHVs). The reliability and validity from 390 VHVs were selected by proportional multi-stage sampling. Data were collected through a questionnaire from March - May 2022 in Uthaithani Province, Thailand. Data were analyzed through descriptive analysis, Mann Whitney U test, Kruskal–Wallis test and logistic regression. The results of the study showed that most of the VHVs had adequate levels of Dhammanamai health literacy ($\overline{X} = $ 61.22, SD. = 13.87), while gender (p = 0.023), occupation (p = 0.026), monthly income (p = 0.004), ability to use a smartphone/computer (p = 0.029), recognition of volunteer roles and duties (p < 0.001), performance motivation (p < 0.001), and social support (p < 0.001) were significantly related to Dhammanamai health literacy. The predicting factors that influenced Dhammanamai health literacy among VHVs were as follows: 1) performance motivation (OR= 1.175, CI=1.055–1.309); 2) age (OR= 1.041, CI=1.012–1.071); 3) occupation (OR= 1.878, CI=1.179–2.990). A very strong variable was performance motivation. In combination, all these factors could predict the Dhammanamai health literacy of the VHVs at 20.7%. We recommend interventions on performance motivation, age, and occupation with the organization of a program to promote Dhammanamai health literacy for VHVs to be ready to perform their duties in the community, including the provision of knowledge to the public.

Key words:

performance motivation; health literacy; Dhammanamai; Thai traditional medicine; village health volunteers

INTRODUCTION

Health literacy was first presented in 1974 by SK Simonds, who proposed the idea at an academic conference on public health, proposing a framework for health education that emphasized the need to work together on policy advocacy.[1] A high level of health literacy enables people to develop skills and confidence to make informed decisions about their health and the health of their families, to be active partners in their care, and to advocate effectively to their political leaders and policy-makers.[2] The goals of the management and operation of the Thai health system consist of medical treatment, control and prevention with health promotion and disease prevention under the 12th National Health Development Plan.[3] The purpose of this system is to develop the potential for self-care by individuals. The health literacy concepts, measures and development guidelines for Thai proactive health promotion strategies were used to support self-care behavioral modification and good Thai health.[4] In 2019, the Ministry of Public Health committed to driving the Village Health Volunteer (VHVs) development policy. At the time, " VHVs MO PRACHAM BAN " was the mainstay of care, promotion, behavioral modification activity, and people's health care. The Primary Health Care Division aimed to create an idea for training processes for upgrading VHVs to VHVs MO PRACHAM BAN, including Dhammanamai principles in health promotion service activities program for increasing sustainable self-reliance in local communities.[5] Therefore, people's basic knowledge was related to health promotion, disease prevention and the development of wisdom in Thai traditional medicine (TTM) as the core factor for the success of literacy reform and health communication.[6] TTM does not separate mind and body. It is holistic medicine and the Thai way of life. Promoting health by natural methods is aimed at enhancing healthy behavior, preventing and restoring health. Hence, "Dhammanamai" means health by natural methods.[7] Dhammanamai was applied in Buddhism which consists of 3 concepts as follows: 1) healthy body refers to promoting physical health by exercise, food according to life elements and sleeping, 2) healthy mind refers to promoting mental health. This is a dharma practice which is composed of virtue, concentration and wisdom, 3) healthy behavior refers to promoting the quality of life and family.[8]

VHVs are important people in the public health sector who play a significant role as leaders in health behavior change, engaging and encouraging people to take care of personal, family, and community health.[9] VHVs need to understand health literacy and health behavior regarding Dhammanamai to support the participation process and be role models in their communities.[5]

Many studies on health literacy have identified various groups such as people aged 15 years or older,[10] aging people,[11,12] working people,[13] hypertension patients,[14] type 2 diabetes patients,[15] VHVs,[16-18] immigrants,[19] and corn farmers.[20] Health literacy is significant to gender,[21-22] age,[15,17,22-24] VHV experience,[18] education,[15] occupation,[15] average monthly income,[15,22,25] visual ability,[21] hearing ability,[21] speaking ability,[16] writing ability,[21] ability to use a smartphone/computer,[16] personal motivation,[26] and social support,[22] Furthermore, many researchers have found the factors predicting health literacy to be age,[11-12,27] education,[11,27] occupation,[11] income,[26,28] working motivation,[16] recognition of volunteer roles and duties,[16] and social support.[16,27]

In Uthaithani Province, which is located in Lower Northern Thailand, the

data shows that NCDs account for the top ten diseases with hypertension ranking first.[29] The NCDs rate in Uthaithani is higher than the NCDs mortality rate caused by health determinant factors nationwide in Thailand.[30] Behavior modification and health literacy regarding Dhammanamai is necessary to solve the problem of NCDs as health literacy policy does not have a clear indication. Moreover, there are few reports on health literacy projects and activities that align with "Dhammanamai". The only health literacy and behavioral model of Dhammamai was found to have been studied among village health volunteers in Northern Thailand.[18]

Therefore, the researchers were interested in studying the level of Dhammanamai health literacy, investigating relevant factors such as sociodemographic characteristics, personal ability, performance of duties as VHVs and predicting factors of Dhammanamai health literacy among VHVs in Uthaithani province and using the findings as a guideline for enhancing health literacy, developing VHVs capability, and application for setting policies on TTM at the province level to strengthen Dhammanamai health literacy.

METHODS

The target population of this cross-sectional study was 6,939 VHVs in Uthaithani Province, Thailand, who were registered in the information system of the Primary Health Care Division, Ministry of Public Health, Thailand, on December 10, 2021.[31] A sample of 390 VHVs was calculated by Daniel 1995[32] who defined

the proportion based on a previous study = 5.93,[33] $Z_{1-\alpha/2}$= 1.96, d = 0.593, alpha (α) = 0.05, as shown below:

$$n = \frac{N\sigma^2 Z_{1-\alpha/2}^2}{d^2(N-1)+ \sigma^2 Z_{1-\alpha/2}^2}$$
$$n = 364$$

We added at least 7% to the estimated sample size to allow for loss. Therefore, the sample size needed to be 390 VHVs. The following inclusion criteria applied: VHVs with at least 1 year of VHV experience in the area of study and signed consent forms. People who could not complete the data in the research instruments were excluded. All samples were selected by multi-stage sampling through the steps we designed. First, we divided Uthaithani Province into 8 districts as follows: Mueang Uthaithani District, Thap Than District, Sawang Arom District, Nong Chang District, Nong Khayang District, Ban Rai District, Lan Sak District, and Huai Khot District. Second, we randomized 4 districts from the 8 districts which yielded Mueang Uthaithani District, Sawang Arom District, Lan Sak District, and Huai Khot District. Third, 4 sub-districts were randomized from the 4 districts, which yielded Nam Suem Sub-district from Mueang Uthaithani District, Phai Khiao Sub-district from Sawang Arom District, Thung Na Ngam Sub-district from Lan Sak District, and Huai Khot Sub-district from Huai Khot District. Finally, 390 VHVs were randomized by using stratified random sampling and simple random sampling, respectively, as shown in Figure 1.
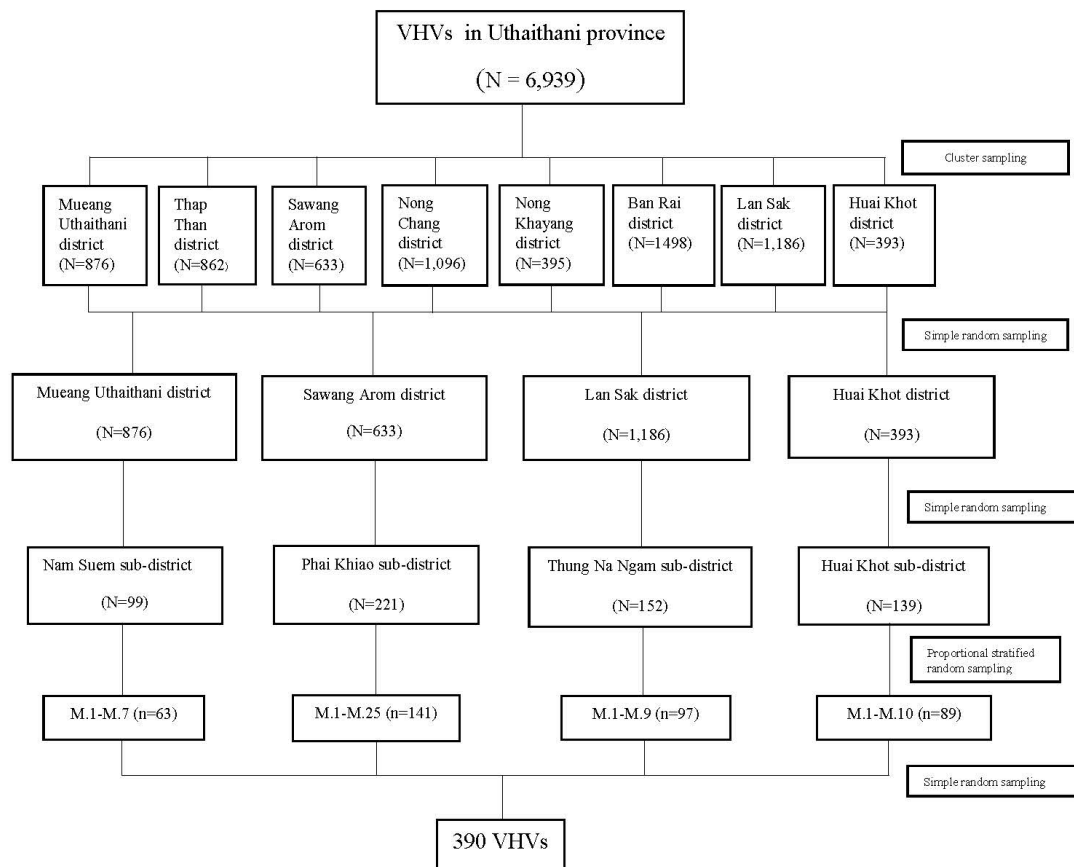
Figure 1. Flowchart for study selection

RESEARCH INSTRUMENTS

The research instrument was a questionnaire constructed by the researchers based on the literature review about health literacy, Dhammanamai and relevant research. The instrument consisted of 4 parts as follows:

Part 1: The general Information section consisted of 8 items on gender, age, years of VHV experience, marital status, health condition, education, occupation, and monthly income. The questionnaire items were presented in the form of multiple-choice items and fill-in-the-blank items.

Part 2: Personal ability with 6 items on visual ability, hearing ability, speaking ability, reading ability, writing ability, and ability to use a smartphone/computer. The

questionnaire items were presented in the form of multiple-choice items.

Part 3: Performance of duties as VHVs with 15 items about expression of recognition of volunteer roles and duties, performance motivation, and social support. The questionnaire items were presented in the form of a rating scale with the following 3 levels: high, moderate and low. Regarding the scoring criteria, each positive item was given 3, 2, and 1, respectively, while each negative item was given 1,2, and 3 points, respectively. The scores were interpreted at 3 levels[34]: a high level at 80% and up, a moderate level at 60-79% and a low level at less than 60%.

Part 4: Dhammanamai Health Literacy (DHL) consisted of 15 items and 15 points for cognitive DHL with 2 items and 10 points on information access and health services DHL and media literacy

DHL, 3 items and 15 points on health communication DHL, 8 items and 40 points of self-management DHL, 6 items and 6 points on judging health care DHL. All 96 points on DHL were grouped as follows: points < 60% - inadequate DHL, points ≥ 60 – < 70 % - adequate DHL, points ≥ 70 – < 80 % - good DHL, and points ≥ 80 % - excellent DHL.[35]

The study was considered and approved by the University of Phayao Institutional Review Board by using the expedited review method, UP-HEC 1.2/061/64.

Before collecting data, the questionnaire was verified for content validity by a panel of 3 experts and analyzed by using index of item – objective congruence, which resulted in a score of 0.95. The instrument was tried with 30 VHSs with similar characteristics to the sample in this study. Cronbach's Alpha[36] was used for the performance of duties as VHVs with a result of 0.951. Kuder-Richardson-20[37] was used for the reliability of DHL cognitive and judging health care DHL with a result of 0.853 and 0.758. Cronbach's alpha coefficient for access to information and health services DHL, health communication DHL, media literacy DHL and self-management DHL were 0.785.

Next, the researchers made appointments with the samples for data collection in March - May 2022 in Uthaithani Province, Lower Northern Thailand. The collection-response rate was 100%. In Step 1, the researchers explained the research methods to the Uthaithani Provincial Health Office in order to obtain permission to conduct research in Uthaithani Province. For Step 2, the researchers contacted the Public Health Office to ask for permission to conduct research in 4 districts and explained the importance of the research in addition to the research process, objectives, and methods.

Step 3 involved setting dates and times for the researcher and VHVs to meet. Unless the researchers met with the VHVs more than three times, new random sampling was used. In Step 4, the researcher team distributed the questionnaires for the interviews and waited for the return after the interviews with the sample group immediately after completion until the sample size was reached as specified.

Data were analyzed with SPSS and the significance level was set at 0.05. The following methods were used to find out statistical values. Data were analyzed with descriptive statistics (percentage, average, maximum value, minimum value, and standard deviation). Due to data being non-normally distributed, Mann–Whitney U test and Kruskal–Wallis test were used to compare the differences in DHL by categorizing personal characteristics, abilities and Performance of duties as VHVs using logistic regression to find out DHL predicting factors.

RESULTS

Demographic data revealed that 83.3 % were female, 61.1 % were 40 – 59 years, 45.9 % were having 1 – 10 years of work experience, 80.8 % were married, 67.9% of the samples in the aspect of health condition were healthy, 56.7% had primary school education, 60 % of the samples earned a living from agriculture and 90.8 % had < 10,000 monthly income.

Table 1 - The total scores for DHL had an adequate level and the components of DHL, information access and health services, health communication, self-management, and judging health care also had an adequate level. Moreover, the level of media literacy was at a good level, and the level of cognitive DHL was at an inadequate level, as shown in Table 1.

Table 1. Mean, standard deviation, and level of DHL (n=390)

DHL	In-adequate	Adequate	Good	Excellent	Mean± SD.	Level
1. Cognitive	195(50.0)	124(31.8)	51(13.1)	20(5.1)	7.02 ± 4.11	In-adequate
2. Information access and health services	88(22.6)	109(27.9)	61(15.6)	132(33.8)	6.64 ± 1.95	Adequate
3. Health communication	122(31.3)	114(29.2)	41(10.5)	113(29.0)	9.34 ± 3.27	Adequate
4. Self-management	84(21.5)	132(33.8)	90(23.2)	84(21.5)	26.94 ± 5.95	Adequate
5. Media literacy	41(10.5)	92(23.6)	44(11.3)	213(54.6)	7.39 ± 1.74	Good
6. Judging health care	143(36.7)	0	105(26.9)	142(36.4)	3.89± 1.28	Adequate
Total	144(36.9)	103(26.4)	96(24.6)	47(12.1)	61.22± 13.87	Adequate

To determine the DHL status of VHVs, the association between sociodemographic characteristics and DHL scores of the VHVs was analyzed. Mann Whitney U tests was used to compare the differences among the factors of gender, marital status, health condition, occupation, and monthly income. Kruskal-Wallis test was used to compare the differences among age, years of VHV experience, and education. There were significant differences in DHL scores as a result of gender, occupation, and monthly income, as shown in Table 2.

Table 2. Correlation between DHL score and sociodemographic characteristics. (n=390)

Sociodemographic characteristics	Freque ncy	Percentage	HLD score		p-value
			Mean ± SD	Min-Max	
Gender					.023* [a]
Male	65	16.7	63.92±14.72	19-88	
Female	325	83.3	60.68±13.66	19-90	
Age					.161 [b]
20-39	70	17.9	59.50±15.12	19-90	
40-59	238	61.1	60.97±13.55	19-90	
≥60	82	21.0	63.43±13.56	19-88	
Mean =51.19; SD = 11.282 ; Min = 21 Max = 80					
Year of VHVs experience					.100 [b]
1 - 10	179	45.9	61.89±13.55	21-90	
11 - 20	140	35.9	60.18±13.55	19-90	
21 - 30	60	15.4	60.22±15.72	19-89	
31 - 40	11	2.8	69.18±10.49	47-80	
Mean = 13.13 ; SD = 9.056 ; Min = 1 Max = 40					

Sociodemographic characteristics	Freque ncy	Percentage	HLD score		p-value
			Mean ± SD	Min-Max	
Marital status					.453[a]
Single	75	19.2	61.88±15.96	22-90	
Married	315	80.8	61.07±13.35	19-90	
Health condition					.090 [a]
No	265	67.9	60.35±14.64	19-90	
Yes	125	32.1	63.06± 11.94	28-87	
Education					.204[b]
Primary school	221	56.7	61.22±13.07	22-89	
Junior high school	64	16.4	63.69±13.54	19-90	
High school	82	21.0	58.49±16.00	19-90	
Diploma/Bachelor	23	5.9	64.13±13.06	37-85	
Occupation					.026* [a]
Agriculture	234	60.0	59.97±14.08	19-89	
No Agriculture	156	40.0	63.11±13.38	28-90	
Monthly income (baht)					.004**
< 10,000	354	90.8	61.92±13.69	19-90	
≥ 10,000	36	9.2	54.36±13.96	19-72	
Mean = 5,044.67 ; SD = 5,000 ; Min = 500 ; Max = 43,000					

Note a = Mann Whitney u tests, b = Kruskal–Wallis test, * p-value < 0.05, ** p-value<0.01

To determine the DHL status of VHVs, the association between personal abilities and DHL scores of the VHVs was analyzed. Mann Whitney U tests were used to compare the differences among the factors of visual ability. Kruskal–Wallis test was used to compare the differences among the hearing ability, speaking ability, reading ability, writing ability, and ability to use a smartphone/computer. There were significant differences in DHL scores as a result of the ability to use a smartphone/computer at $p < 0.05$, as shown in Table 3.

Table 3. Correlation between DHL score and personal ability. (n=390)

Variables	Frequency	Percentage	HLD score		p-value
			Mean ± SD	Min-Max	
Personal ability					
Visual ability					.384[a]
no glasses	185	47.4	60.54±14.65	19-90	
use glasses	205	52.6	61.84±13.14	22-89	
Hearing ability					.977[b]
communicable	2	0.5	62.00±5.66	58-66	
fair	75	19.2	60.39±15.15	21-86	
good	313	80.3	61.42±13.61	19-90	
Speaking ability					.287[b]
communicable	9	2.3	65.56±13.13	46-79	
fair	94	24.1	59.61±14.13	21-88	
good	287	73.6	61.62±13.80	19-90	

Variables	Frequency	Percentage	HLD score		p-value
			Mean ± SD	Min-Max	
Reading ability					.715[b]
communicable	2	0.5	66.00±0	66-66	
fair	110	28.2	60.32±14.07	21-88	
good	278	71.3	61.55±13.85	19-90	
Writing ability					.419[b]
communicable	4	1.0	57.50±9.85	48-66	
fair	142	36.4	60.25±13.87	21-88	
good	244	62.6	61.85±13.93	19-90	
Ability to use a smartphone/computer					.029[*b]
communicable	66	16.9	59.29±10.61	37-80	
fair	217	55.6	60.68±14.55	19-90	
good	107	27.4	63.51±14.05	19-90	

Note a = Mann Whitney u tests, b = Kruskal–Wallis test, * p-value < 0.05

To determine the DHL status of VHVs, the association between performance as VHVs and DHL scores of the VHVs was analyzed. Kruskal–Wallis test was used to compare the differences among the recognition of volunteer roles and duties, performance motivation, and social support. There were significant differences in DHL scores at p < 0.001, as shown in Table 4.

Table 4. Correlation between DHL score and performance of duties. (n=390)

Variables	Frequency	Percentage	HLD score		p-value
			Mean ± SD	Min-Max	
Performance of duties as VHVs					
Recognition of volunteer roles and duties					<0.001***
low level	20	5.1	50.90±10.67	30-72	
moderate level	162	41.5	59.98±13.04	19-88	
high level	208	53.3	63.19±14.26	19-90	
Performance motivation					<0.001***
low level	11	2.8	48.55±13.49	29-72	
moderate level	181	46.4	57.92±12.68	21-88	
hight level	198	50.8	64.94±13.81	19-90	
Social support					<0.001***
low level	13	3.3	53.15±12.34	29-67	
moderate level	169	43.3	58.56±13.35	19-90	
high level	208	53.3	63.89±13.82	19-90	

*Kruska-wallis test, ***p-value<0.001*

Multiple logistic regression revealed that three independent variables influenced the DHL of VHVs. A very strong variable was performance motivation in this study where 3 significant variables affected the DHL, performance motivation, age and occupation. These 3 variables predicted the DHL of VHVs at 20.7%, as shown in Table 5.

Table 5. Multiple logistic regression for DHL. (n=390)

No	Varaiable	B	Wald-test	P-value	Odd Ratio	95% CI
1	gender	-0.517	2.587	0.108	0.596	0.318-1.120
2	age	0.040	7.644	0.006**	1.041	1.012-1.071
3	year of VHVs experience	-0.018	1.327	0.249	0.982	0.952-1.013
4	marital status	0.065	0.051	0.821	1.067	0.609-1.871
5	health condition	0.128	0.260	0.610	1.137	0.694-1.863
6	education	0.217	0.612	0.434	1.242	0.721-2.139
7	occupation	0.630	7.046	0.008**	1.878	1.179-2.990
8	monthly income	-0.771	3.700	0.054	0.463	0.211-1.015
9	personal ability	0.026	0.140	0.708	1.026	0.897-1.173
10	recognition of volunteer roles and duties	0.038	0.667	0.414	1.039	0.948-1.139
11	performance motivation	0.161	8.564	0.003**	1.175	1.055-1.309
12	social support	0.021	0.092	0.762	1.021	0.892-1.170
	Constant = -6.831					
	2 Loglikelihood = 473.927	Nagelker R^2 = 0.207 ; Chi-square test = 65.896				

*Note*** p-value < 0.01

DISCUSSION

The study revealed that the VHVs showed a low understanding of Dhammanamai principles that was insufficient for practicing self-healthcare following Dhammanamai principle-based Thai traditional medicine (TTM). When considering each aspect of health literacy, it was discovered that VHVs could access research information and health services by themselves, but remained unable to apply the information for accurate decision-making, likely due to a lack of or restricted access to information and health services. Certain subdistrict health promotion hospitals continue to have shortages of full-time TTM staff, causing a lack of health communication regarding self-healthcare following Dhammanamai principle-based TTM to VHVs. The VHVs can listen, speak, read, and write to communicate amongst themselves and others to understand and accept Dhammanamai principles, but only to a certain degree of efficiency. They show an ability for self-management in terms of emotion, internal needs, and environmental obstacles to their health. This corresponds with the idea of Nutbeam[38], who explained that self-management is the ability to determine a goal and plan one's own behaviors to achieve good practices while judging health care as the ability to reject, avoid, or select practices that promote better health. In terms of media literacy, the VHVs verified the information received and made correct decisions. Therefore, continuous promotion of health literacy is recommended.

Different genders influenced differences in average DHL with statistical significance. This corresponds with the findings of a study by Suramitmaitree[23] and Jovic -Vranes et al[39] who found that gender is related to health literacy levels and discovered that males have higher health literacy than females.

Different occupations also influenced differences in average DHL with statistical significance. Furthermore, it was discovered that people outside agricultural occupations show higher health literacy than those engaged in agricultural occupations because farmers only work locally within their communities, leading to few interactions with the potential of

receiving health information. This also allows people outside of the agricultural field to have higher social status and a better chance to develop DHL. This finding corresponds with the findings of a study by Rattanawarang et al[15] and Jovic -Vranes et al[39]. who found that occupation is related to health literacy levels.

Different monthly incomes influenced differences in average DHL with statistical significance and it was found that people with monthly incomes of < 10,000 baht had higher health literacy than those with monthly incomes of ≥ 10,000 baht. In this study, 90% of VHV leaders had low incomes, and 80% were able to use smartphones/computers at fair-good levels. Therefore, they had access to various applications that are conducive to increasing DHL for the VHVs. This is inconsistent with a study by Liu YB et al[11] and Rattawarang et al[15], who found that people with higher income showed higher health literacy than those with lower income.

Differences in the ability to use smartphones/computers influenced differences in average DHL with statistical significance and it was discovered that the better people were able to use smartphones or computers, the more improved their DHL was. This is likely due to the policy of the Ministry of Public Health to develop VHVs into 4.0 VHVs with skills to utilize technologies such as smartphones and applications that allow access to more health literacy. This finding corresponds with the findings of studies on parents' use of technologies for health management: in a health literacy perspective on parents and technology[40].

Differences in recognition of volunteer roles and duties influenced differences in average DHL with statistical significance and it was found that higher recognition leads to higher health literacy. This is likely due to recognition serving as a reminder of the operation's goals and enabling VHVs to work more effectively. The recognition of roles and duties allows for more health literacy. Therefore, promotion of this recognition is recommended to help develop skills. This matches with the study of Lupattelli et al[41].

Different performance motivations influenced differences in average DHL with statistical significance. It was discovered that higher performance motivation led to a higher DHL, because higher performance motivation can lead to more health literacy development. VHVs feel more encouraged to obtain more knowledge to reduce worry in their work and behave as good examples to the community. This finding corresponds with the study of Edwards et al[42]. who found that motivation influences health literacy.

Differences in social support levels influenced differences in average DHL with statistical significance and it was discovered that VHVs who received social support had higher DHL, likely because closely related people such as family, community, public health officers, Thai traditional medicine staff, and others encouraged the VHVs to develop their health literacy. This is also the case with compliments, support, and collaboration of people in communities. This finding corresponds with the study of Ellis et al[43]. and the idea of Jordan et al[44]. who stated that the participation of a community is an external factor leading to health literacy.

The results indicated that performance motivation, age, and occupation could predict DHL. Performance motivation positively affects DHL with statistical significance. As performance motivation increases, so does DHL. This finding corresponds with the study of Boonnum[16] who discovered that performance motivation is one of the factors predicting the health literacy of VHVs. Older people have higher DHL than

those who are younger. The study also found that senior VHVs received continuous development in knowledge and skills from public health officers and by other means. This is inconsistent with a study[11-12,27], which found that younger people showed higher health literacy than those who are older, however, these were not studied in the VHV group. People outside of agricultural occupations have higher DHL than those who work in agricultural occupations. This finding corresponds with the findings of a study by Liu et al[11]. who found that occupation is one of the factors predicting health literacy. Therefore, the promotion of continuous health literacy development policy is recommended[45].

CONCLUSION

The study revealed that the sample group showed a low understanding of DHL that was insufficient for practicing self-healthcare following Dhammanamai principle-based Thai traditional medicine. Gender, occupation, monthly income, ability to use a smartphone/computer, recognition of volunteer roles and duties, performance motivation, and social support were significantly related to DHL. The predicting factors that influenced DHL among VHVs were performance motivation, age, and occupation. In combination, all these factors could predict the DHL of the VHVs at 20.7%.

RECOMMENDATIONS

The agency can apply the results to formulate policies on Thai traditional medicine at the province level to strengthen DHL.

Those involved are Thai traditional medicine staff and other health personnel. These people can use the research findings to create DHL programs.

Academic people or those who are interested can use the research findings as further primary evidence related to DHL.

LIMITATIONS

Although probability-based sampling methods may have random deviations resulting in abnormal curves.

REFERENCES

1. Simonds SK. Health education as social policy. Health Education Monographs. 1974;2(1):1-10. doi: 10.1177/ 10901981740020S102.
2. World Health Organization (WHO). Health literacy [Internet]. [Cited 2022 May 15]. Available from: https:// www.who.int/europe/teams/behavioura l-and-cultural-insights/health-literacy
3. Thailand. Drug and Medical Supply information Center. The national health development plan, strategic plan, issue 12 [Internet]. Bangkok: Ministry of Public Health. 2021 [Cited 2022 May 5]. Available from: http://dmsic. moph.go.th/index/detail/6991.
4. Kaeodumkoeng K. Health literacy: access, understand and application. Nonthaburi: Amarin Book Center. 2018.
5. Thailand. Department of Health Service Support. Health literacy from village health volunteer to village health volunteer MO PRACHAM BAN 2020 [Internet]. Bangkok: Ministry of Public Health; 2020 [Cited 2022 May 15]. Available from: http://phc.moph. go.th/www_hss/data_center/dyn_mod/ Manual_official.pdf
6. Tanasugarn C. Health literacy: lessons learned from international experience to the Thailand context. THJPH. 2018; 48(1):1-4.
7. Kade S. Healthy by natural method [Internet]. [Cited 2021 May 10]. Available from: https://www.si.

mahidol.ac.th/sidoctor/e-pl/ articledetail.asp?id=1352

8. Somchai N. Thai traditional and alternative health profile. Thai traditional medicine, indigenous medicine and alternative medicine 2011 –2013. 1st ed. Kaeo Chao Chom Media and Print Materials Center: Bangkok. 2014:39–71.

9. Thailand. Department of Health Service Support. Driving of health literacy and health communication 2017[Internet]. Bangkok: Ministry of Public Health. 2017 [Cited 2021 June 1]. Available from: www.anamai.moph.go.th/ ppf2017/Downl oad/29/bai/32.pdf

10. Berens E-M, Vogt D, Messer M, Hurrelmann K, Schaeffer D. Health literacy among different age groups in Germany: results of a cross-sectional survey. BMC Public Health. 2016;16(1151):1-8.

11. Liu YB, Liu L, Li YF, Chen YL. Relationship between health literacy, health-related behavior and health status: A survey of elderly Chinese. Int J Environ Res Public Health. 2015;12(8):9714-25.

12. Kobayashi L C, Wardle J, Wolf M S, Wagner C V. Aging and Functional Health Literacy: A Systematic Review and Meta-Analysis. J Gerontol B Psychol Sci Soc Sci. 2016;71(3):445–57.

13. Tantranont K, Wisutthananon A, Suthakorn W, Supavititpatana B, Lirtmunlikaporn S, Kampoun S. Factors associated with health literacy among working population, NongPa Krang subdistrict, Mueang district, Chiang Mai province. LPHJ. 2020;16(2):61-71.

14. Chotchai T, Seedaket S, Taearak K, panyasong S, Buajun A. Factors related to health literacy in prevention of hypertension among group at risk in Samran sub-district, Muaeng district,

Khon Kaen province. SCNJ. 2020;7(1):45-56.

15. Rattanawarang W, Chantha W. Health literacy of self-care behaviors for blood glucose control in patients with type 2 diabetes, Chainat province. The Journal of Baromarajonani College. 2018; 24(2):34-51.

16. Boonmun T. Factors affecting to health literacy among village health volunteers in Sukhothai province. Phitsanolok: Naresuan University; 2021.

17. Ngasangsai P, Sornseeyon P, Phattarabenjapol S. A case study of health literacy of village health volunteers. Isan J Pharmaceutical Sciences. 2014;9:82-87.

18. Mueangchang W, Jantarach N, Srisookkum T. Health literacy and behavioral model of Dhammanamai among village health volunteers in the northern Thailand. J Public Hlth Dev. 2022;20(3):108-20.

19. Lee HY, Rhee TG, Kim NK. Health literacy as a social determinant of health in Asian American Immigrants: findings from a population-based survey in California. J Gen Intern Med. 2015;30(8):1118–24.

20. Srisookkum T, Supbumrer R. Health symptoms and health literacy of pesticides used among Thai cornfield. Iran J Public Health. 2020;49(1):2095-202.

21. Nilnate W. Health literacy in Thai elders in senior citizens club of Bangkok. Bangkok: Chulalongkorn University; 2014.

22. Kamkum N, Kespichayawattana J. Study of Health Literacy of Older Person, Bangkok Metropolis. J Royal Thai Army Nurses. 2020;21(3):382-91.

23. Suramitmaitree B. Health Literacy and Operation Situation Enhance the health intelligence of Thai people in order to support the ASEAN community.

Bangkok: Ministry of Foreign Affairs;2013.

24. Rathong A. Health literacy and health behaviour, 3Aor 2Sor, for the village health volunteers (VHVs): Case study of Hintok sub-district, Ronphibun district, Nakhon Si Thammarat province. JDHSS. 2019;15(3):62-70.

25. Schillinger D, Grumbach, K, Piette J, Wang F, Osmond D, Daher C, et al. B. Association of Health Literacy with Diabetes Outcomes. JAMA. 2002; 288(4):475-82.

26. Khumthong T, Kaedumkoeng W. Factors influencing health literacy for people at risk of Diabetemellitus and Hypertension of UthaiThani and Ang Thong. Science and Technology Silpakorn University. 2016;3(6):67-85.

27. Sangkhaphong A, Toonsiri L. W. Influencing Health Literacy among Family Caregivers of Chronic Disease Patients in Community. J Nursing and Health Care. 2018;37(2):55-62.

28. Tiparat W, Suwanweala S, Wauters Y. Factors predicting health literacy of older people with hypertension and co-morbidity in Trang province. SCNJ. 2020;7(2):26-38.

29. Thailand. Primary Health Care Division. Information system of primary health care [Internet]. Bangkok: Ministry of Public Health. 2021 [cited 2022 May 20]. Available from: https://uti.hdc.moph.go.th/hdc/reports/page.php?cat_id=491672679818600345dc1833920051b2

30. Thailand. Division of non communicable diseases. Number and mortality 5 NCDs. [Internet]. Bangkok: Ministry of Public Health. 2020 [cited 2022 May 20]. Available from: http://www.thaincd.com/2016/mission/documents-detail.php?id=14220&tid=32&gid=1-020

31. Thailand. Primary health care division. Information system of primary health care [Internet]. Bangkok: Ministry of public health. 2021 [cited 2021 Dec 10].

Available from: https://www.thaiphc.net/phc/phcadmin/administrator/Report/OSMRP00001.

32. Daniel WW. Biostatistics: A Foundation of Analysis in the Health Sciences. 6th ed. New York: John Wiley & Sons; 1995.

33. Tachavijitjaru C, Srisupornkornkul A, Changtej S. Selected factors related with the health literacy of village health volunteer. J Royal Thai Army Nurses. 2018;19:320-32.

34. Best J. W, Kahn J. V. Research in Educational. 7th ed. Boston: Allyn and Bacon; 1993.

35. Thailand. Health education division. Assessment tools and programs health literacy and health behaviors [Internet]. Bangkok: Ministry of Public Health. 2021 [cited 2018 Aug 8]. Available from: http://www.nkp-hospital.go.th/th/H.ed/mFile/20180627124525.pdf

36. Cronbach LJ. Essentials of psychological testing. 5th ed. Harper Collins Publishers: New York; 1990.

37. Richardson J. Ecotourism & Nature based Holidays. Sydney: Australian Print Group; 1993.

38. Nutbeam D. The evolving concept of health literacy. Soc Sci Med. 2008;67(12):2072-8. doi:10.1016/j.socscimed.2008.09.050.

39. Jovic-Vranes A, Bjegovic-Mikanovic V, Marinkovic J. Functional health literacy among primary health-care patients: data from the Belgrade Pilot Study. J Public Health. 2009;31(4):490-5.

40. Meyers N, Glick AF, Mendelsohn AL, Parker RM, Sanders LM, Wolf MS, et al. Parents' Use of Technologies for Health Management: A Health Literacy Perspective. Acad Pediatr. 2020;20(1):23-30.

41. Lupattelli A, Picinardi M, Einarson A, Nordeng H. Health literacy and its association with perception of teratogenic risks and health behavior

during pregnancy. Patient Educ Couns. 2014;96(2):171-8.

42. Edwards M, Wood F, Davies M, Edwards A. The development of health literacy in patients with a long-term health condition: the health literacy pathway model. BMC Public Health. 2012;12(1):1-15.

43. Ellis J, Mullan J, Worsley A, Pai N. The role of health literacy and social networks in arthritis patients' health information-seeking behavior: a qualitative study. Int J Family Med. 2012:1-6. Doi: 10.1155/2012/397039.

44. Jordan J. E, Buchbinder R, Osborne R. H. Conceptualising Health Literacy from the Patient Perspective. Patient education and counseling. 2010;79(1): 36-42.

45. Visanuyothin S, Chatanuluk R, Saengsuwan S, Rojanavarapong A, Pornchanya P. Health literacy of village health volunteers in municipalitiy, Nakhon Ratchasima. J Public Hlth Dev. 2015;13(1):37-54.