



Effects of a Long COVID Literacy Enhancement Program on Reducing the Severity of Post-Infection COVID-19 Behaviors of Elderly in Communities, Bangkok Metropolitan Area*

ผลของโปรแกรมเสริมสร้างความรอบรู้ลองโควิดต่อพฤติกรรมลดความรุนแรงของอาการหลังติดเชื้อโควิด-19 ของผู้สูงอายุในชุมชน กรุงเทพมหานคร*

Kaewta	Hlanden**	แก้วตา	หลานเด็น**
Yupa	Jewpattanakul***	ยุพา	จิ๋วพัฒนกุล***
Rukchanok	Koshakri****	รักชนก	คชไกร****

Abstract

Long COVID symptoms in elderly with COVID-19 affect their lives. Enhancing health literacy can reduce the severity of Long COVID symptoms. This randomized controlled trial explored the effects of a Long COVID literacy enhancement program on reduction of the severity of post-infection COVID-19 behaviors of elderly in Bangkok communities. The two-group pretest-posttest design applied Nutbeam's health literacy as a conceptual framework. Sixty four elderly Bangkok residents, aged 60-80 years with COVID-19 for five days to two months were randomly assigned, by multi-stage random sampling with a computer, to an experimental group or a control group with 32 per group. The experimental group received the Long COVID literacy enhancement programme consisting of healthy dietary instruction; demonstrations on selecting online sources of knowledge about Long COVID via Google, Facebook, and YouTube; lung exercises; and breathing exercises for relaxing from stress. The participants were instructed to engage in lung and breathing exercises at home once a day and document their exercise for 12 weeks. Pretest and posttest data were analyzed with independent t-test and paired t-test statistics.

The findings showed that the experimental group had a significantly higher mean score for reducing severity of post-infection COVID-19 behaviors after the experiment ($M = 74.44$, $SD = 5.93$) than before the experiment ($M = 52.00$, $SD = 9.64$, $t = 9.78$, $p < .001$). Moreover, the experimental group had a significantly higher mean score for reducing severity of post-infection COVID-19 behaviors after the experiment ($M = 74.44$, $SD = 5.93$) than the control group ($M = 50.38$, $SD = 7.96$, $t = 13.70$, $p < .001$).

These findings provide a guideline for community nurse practitioners, professional nurses, and health teams to reduce the severity of symptoms of post-infection COVID-19 patients.

Keywords: Health literacy; Long COVID; Severity of symptoms; Elderly

* Master's thesis, Master of Nursing Science Program in Community Nurse Practitioner, Faculty of Nursing, Mahidol University

** Graduate student of Nursing Science Program in Community Nurse Practitioner, Faculty of Nursing, Mahidol University

*** Corresponding author, Associate Professor, Faculty of Nursing, Mahidol University;
email: yupa.jew@mahidol.ac.th

**** Associate Professor, Faculty of Nursing, Mahidol University

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บทคัดย่อ

อาการหลังติดเชื้อโควิดระยะยาวในผู้สูงอายุที่ติดเชื้อโควิด-19 กระทบกับการดำเนินชีวิต การเพิ่มความรู้ด้านสุขภาพสามารถช่วยลดความรุนแรงของอาการหลังติดเชื้อโควิด-19 การวิจัยเชิงทดลองแบบสุ่มที่มีกลุ่มควบคุมครั้งนี้ มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมการเสริมสร้างความรอบรู้ลองโควิดต่อพฤติกรรมลดความรุนแรงของอาการหลังติดเชื้อโควิด-19 ของผู้สูงอายุในชุมชน กรุงเทพมหานคร การวิจัยสองกลุ่มวัดผลก่อนการทดลองและหลังการทดลองครั้งนี้ ประยุกต์ใช้แนวคิดความรู้ด้านสุขภาพของนัทปิมมาเป็นกรอบแนวคิด กลุ่มตัวอย่างเป็นผู้สูงอายุที่มีอายุ 60-80 ปี จำนวน 64 คน ได้รับการวินิจฉัยเป็นโรคโควิด-19 ครบ 5 วัน ถึง 2 เดือน กลุ่มตัวอย่างถูกสุ่มแบบหลายขั้นตอนโดยใช้คอมพิวเตอร์ เป็นกลุ่มทดลองหรือกลุ่มควบคุม กลุ่มละ 32 คน กลุ่มทดลองได้รับโปรแกรมเสริมสร้างความรอบรู้ลองโควิด ซึ่งประกอบด้วยการสอนการรับประทานอาหารที่มีประโยชน์ สาธิตการเลือกสื่อความรู้เกี่ยวกับลองโควิดผ่านสื่อ Google, Facebook และ You Tube ฝึกบริหารปอดและฝึกหายใจเพื่อคลายเครียด แล้วให้กลุ่มตัวอย่างบริหารปอดและหายใจที่บ้านวันละ 1 ครั้ง พร้อมจดบันทึกการออกกำลังกายเป็นเวลา 12 สัปดาห์ วิเคราะห์ข้อมูลก่อนและหลังการทดลองด้วยสถิติ independent t-test และ paired t-test

ผลการศึกษาพบว่า กลุ่มทดลองมีคะแนนเฉลี่ยพฤติกรรมลดความรุนแรงของอาการหลังติดเชื้อโควิด-19 หลังการทดลอง ($M = 74.44$, $SD = 5.93$) มากกว่าก่อนการทดลอง ($M = 52.00$, $SD = 9.64$) อย่างมีนัยสำคัญทางสถิติ ($t = 9.78$, $p < .001$) นอกจากนั้นยังพบว่ากลุ่มทดลองมีคะแนนเฉลี่ยพฤติกรรมลดความรุนแรงของอาการหลังติดเชื้อโควิด-19 หลังการทดลอง ($M = 74.44$, $SD = 5.93$) มากกว่ากลุ่มควบคุม ($M = 50.38$, $SD = 7.96$) อย่างมีนัยสำคัญทางสถิติ ($t = 13.70$, $p < .001$)

ผลการวิจัย ให้แนวทางสำหรับพยาบาลเวชปฏิบัติชุมชน พยาบาลวิชาชีพ และทีมสุขภาพ ในการลดความรุนแรงของอาการหลังติดเชื้อโควิด-19 ในผู้ป่วย

คำสำคัญ: ความรอบรู้ด้านสุขภาพ ลองโควิด ความรุนแรงของอาการ ผู้สูงอายุ

* วิทยานิพนธ์หลักสูตรพยาบาลศาสตรมหาบัณฑิต สาขาการพยาบาลเวชปฏิบัติชุมชน คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล

** นักศึกษาหลักสูตรพยาบาลศาสตรมหาบัณฑิต สาขาการพยาบาลเวชปฏิบัติชุมชน คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล

*** ผู้เขียนหลัก รองศาสตราจารย์ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล email: yupa.jew@mahidol.ac.th

**** รองศาสตราจารย์ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล

วันที่รับบทความ 15 มิถุนายน 2567 วันที่แก้ไขบทความ 20 ตุลาคม 2567 วันที่ตอบรับบทความ 11 พฤศจิกายน 2567



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Background and significance

Post-acute COVID symptoms can begin from infection and persist for over three weeks. Long COVID symptoms persist more than 12 weeks after COVID-19 infection, having been present for at least two months. These symptoms may be new symptoms after COVID-19 infection or old symptoms continuing after recovery from COVID-19 infection (World Health Organization, 2022). Long COVID is found in 30-50% of patients. Symptoms frequently encountered in elderly patients consist of weakness, coughing, dyspnea, dizziness, headaches, loss of scent, loss of taste, and chest discomfort. The etiology of Long COVID-19 remains unclear, but behaviors can be adjusted to reduce symptom severity (Phuaphae et al., 2021).

Long COVID symptoms in elderly patients with COVID-19 affect their lives physically, psychologically, socially, and economically. Without proper care, these patients may experience weakness, muscle aches, insomnia, chronic diseases, and complications, causing a country's medical expenses to rise (Retornaz et al., 2022). Behavioral modifications among elderly patients with COVID-19 can reduce the risk of Long COVID symptoms. Therefore, offering advice on healthy food selection, lung exercises, and breathing exercises to relax from stress is necessary (Al-Jabr et al., 2022).

Thailand is one of numerous countries which has had many COVID-19 infections. The number of patients increased from 2,839 patients in 2020 to 4,740,865 patients in 2023 with a total of 34,232 deaths (Department of Disease Control, Ministry of Public Health, 2023). Currently, Thailand's elderly population, aged above 60 years, constitutes 18.94% of the overall population. Of this number, 5.37% have been infected with COVID-19. This percentage is higher than that for younger adults and children (Department of Elderly Affairs, 2023). When elderly people become infected with COVID-19, symptoms can be significant. Even though the body's immunity increases to the point of eliminating the virus, immunity and inflammation may not return to normal conditions (Saenprasarn et al., 2022).

According to Thailand's statistics from a total of 77 provinces, 253,896 elderly people aged 60 years and up were found to have been infected with COVID-19, including 23,279 in Bangkok (Department of Disease Control, Ministry of Public Health, 2023), the highest in the country. Eastern Bangkok was found to have 7,345 elderly patients who were infected while the area itself had the highest number of infections in Bangkok. Post-COVID-19 and Long COVID elderly patients increased from 235 patients in 2020 to 769 in 2023, higher than other areas in Bangkok (Public Health Center 69 Kannayao, 2023).

From the literature review, previous research has explored only the effect of programs on reducing COVID-19 symptoms in COVID-19 patients (Legacy et al., 2022). Almost all was experimental research using self-management support theory as a guideline to reduce symptoms in patients groups of various ages who were infected with COVID-19. Previous activities were mainly focused on exercise. Although self-management concepts can encourage patients to practice better self-care and reduce COVID-19 symptoms, sustainable management skills are



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limited. On the other hand, Nutbeam's health literacy concept emphasizes overall self-learning (Nutbeam, 2008). Therefore, this concept will provide deeply trustworthy knowledge, wise decision making, and continuous sustainable management skills for those infected with COVID-19 (Liu et al., 2021).

The researcher, therefore, will apply Nutbeam's health literacy concept as part of a Long COVID literacy enhancement program on behavior to reduce the severity of COVID-19 symptoms, post-infection, for the elderly in communities. The implications of the findings will benefit community nurse practitioners, professional nurses, and health teams in designing programs to reduce the severity of symptoms, post-infection, of COVID-19 patients in the Next Normal era.

Research objectives

1. To compare differences in mean scores of reduction the severity of post infected COVID-19 behaviors between before and after intervention of the experimental group.
2. To compare differences in mean scores of reduction the severity of post infected COVID-19 behaviors after intervention between the experimental and the control group.

Research hypotheses

1. Mean scores for reduction of the severity of post-infection COVID-19 behaviors of the experimental group before and after intervention demonstrate a significant difference.
2. Mean scores for reduction of the severity of post-infection COVID-19 behaviors after the intervention between the experimental and the control groups demonstrate a significant difference.

Conceptual framework

The researcher applied Nutbeam's health literacy conceptual framework (2008) to develop the Long COVID literacy enhancement program. Health literacy refers to the intellectual and social skills that determine motivation and a person's ability to access, understand, and use information to achieve good health; it is classified into three levels. Level one, functional health literacy, includes skills in reading, writing, and thinking in order to be able to convey information about health to use in one's daily life to maintain health status. The second level, interaction health literacy, refers to participatory learning, and using communication skills such as speaking, reading, or writing to communicate with others for understanding, including the application of modern information to change health conditions. The third level, critical health literacy includes the ability to apply information and to achieve social changes.

As part of the Long COVID literacy enhancement program, functional health literacy activities were organized to increase information access skills in order to help post-COVID-19 elderly to have the ability to select sources of health information about severity reduction behaviors for Long COVID-19 symptoms. By demonstrating how to select reliable health information on this topic from online sources such as Google, Facebook, and YouTube, elderly individuals who have recovered from COVID-19 can improve their digital literacy skills. In addition,



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participants can practice on mobile phones using word card games with Long COVID search terms to develop their search skills regarding these severity reduction behaviors. Regarding functional health literacy activities, participants were provided with a basis for communicative skills. They exchanged information on Long COVID-19 symptoms, healthy dietary behavior, lung exercises, and breathing exercises. Their information access skills and communicative skills helped them to have better decision-making skills related to Long COVID-19 symptom severity reduction behaviors. Therefore, elderly participants will have increased in Long COVID-19 symptom severity reduction behaviors critical health literacy skills.

Methodology

This randomized controlled trial research with a two-group pretest-posttest design provided activities for 12 weeks. The experimental group was given the Long COVID literacy enhancement program while the control group received routine care, but did not undergo the program.

Population and sample

The population included 23,279 elderly people aged 60-80 years who were diagnosed with COVID-19 and living in the Bangkok area.

The sample in this study was elderly people aged 60-80 years who were diagnosed with COVID-19 for five days to two months and lived at home in nine districts in Eastern Bangkok.

Sample size was calculated using the G * power 3.1.9.7 program (Faul, 2007) with the alpha value set at 0.05, and power of the test set at 0.80. An effect size of 0.68 was obtained from a previous study (Chuaboonchai et al., 2022) where the experimental group had a mean posttest COVID-19 prevention behavior score of 62.05 points with a standard deviation of 5.88 while the control group had a mean score of 58.21 points with a standard deviation of 5.33. The G * power calculation was replaced and a sample size of 29 subjects per group, or a total of 58 subjects, was obtained. To prevent the risk of sample loss, the sample size was enlarged by ten percent (Polit & Hungler, 1999) resulting in a sample size for this study of 64 subjects, with 32 subjects each assigned to the experimental group and the control group.

The sample was selected by computer using multi-stage sampling. Inclusion criteria included elderly people aged 60-80 years who were diagnosed with COVID-19 for between five days and two months and lived at home with family members aged 18-59 years in Eastern Bangkok. Potential participants were also required to have a body weight below 70 kgs, or BMI 18.5-24.9 kg/m², and have ability to speak, read, and write in Thai. Moreover, they had to have a smart phone with the LINE application and Internet access. The exclusion criteria were having lung disease, respiratory disease, heart disease, hypertension, uncontrolled diabetes mellitus, chronic kidney disease, or cancers as well as having disability, being bed-ridden, or having mental disorders.



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Research instruments

1. The data collection instruments, developed by the researcher from the literature review and the related research for post COVID-19 elderly patients, were as follows:

1.1 The demographic data questionnaire had 13 questions concerning gender, age, weight, height, level of education, occupation, family income, concomitant diseases, symptoms while infected with COVID-19, and treatment received.

1.2 The Long COVID literacy questionnaire had 19 questions on six components: information access skills, knowledge and understanding skills, communication skills, self-management skills, media literacy skills, and decision-making skills. Responses were on a 5-level rating scale ranging from “Never Practiced” (1 point) to “Practiced Every Time” (5 points). The questionnaire had a score range of 19-95 points. High scores meant excellent Long COVID literacy.

1.3 The Long COVID-19 symptom severity reduction behavior questionnaire had 20 questions with responses on a 5-level rating scale ranging from “Never Practiced” (1 point) to “Practiced Every Time” (5 points). The questionnaire had a score range of 20-100 points. High scores meant elderly patients had excellent symptom severity reduction behaviors.

1.4 The post-COVID-19 symptoms questionnaire consisted of 10 questions on post-COVID-19 elderly patients’ symptoms, including weakness, dyspnea/hyperventilation, coughing, insomnia, headaches, hair loss, dizziness, anxiety/stress, short memory, and chest pain. Responses were on a 5-level rating scale ranging from “No Symptoms” (1 point) to “Had Symptoms for 6-7 Days/Week (5 points). The score range was 10-50 points with higher scores indicating many post-COVID symptoms.

2. The instrument used in the experiment was the Long COVID literacy enhancement program created from Nutbeam’s health literacy concept.

2.1 Functional health literacy enhancement included the following activities: 1) health literacy enhancement manual distribution; 2) group activities with demonstrations and feedback demonstrations on selection of knowledge about Long COVID-19 symptom severity reduction behaviors in media from online sources via Google, Facebook, and You Tube.

2.2 Communicative/interactive health literacy enhancement involved the following activities: communication by speaking, reading, or writing about self-care behaviors within the group and communicating via the Line application.

2.3 Critical health literacy enhancement consisted of the following activities: 1) credible online media selection; 2) an activity for elderly patients to exchange benefits regarding Long COVID-19 symptom severity reduction behaviors to create shared knowledge.

Ethical considerations

Study protocol conformed to the Declaration of Helsinki and was approved by the Institutional Review Board, Faculty of Nursing, Mahidol University, No. IRB – NS 2023/29.0105, approval date: July 18, 2023. The participants read and signed an informed consent form before participating in the study.



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Data collection

This research was conducted over a period of 12 weeks in 2023.

Experimental Group: The participants in this group had online meetings via the Line application with VDO calls for one hour per group. The experimental group was divided into two groups of 16 subjects each. Activity details were as follows.

1. On the first day in week 1, participants completed the demographic data questionnaire, the long COVID literacy questionnaire, the Long COVID-19 symptom severity reduction behavior questionnaire, and the post-COVID-19 symptoms questionnaire. Participants were presented with Long COVID online sources, searching Long COVID information via phones by using a word card game, and discussing this knowledge within the group. Moreover, they watched a Long COVID incidence video, and were taught about Long COVID-19 symptom severity reduction behaviors.

In addition, they were shown four lung exercise positions to prevent Long COVID, as follows, repeating each 10 times: 1) practice inhaling deeply and slowly through the nose and exhaling by the mouth; 2) join both hands at the back of the head and inhale through the nose; 3) stretch arms outwards with arms raised up to be joined at the front; inhale through the nose and stretch both arms out to the sides; exhale fully and return to the original pose; and finally, 4) sit up straight in a chair, spreading the legs slightly; place both hands on the waist and inhale through the nose, and exhale through the mouth; then, turn left and alternately turn right. After completing all four positions, elderly patients were directed to rest and advised to practice once a day at home.

2. In week 3, an online meeting activity was hosted on the topic of communication skills by using participatory learning. 1) Elderly patients were directed to review healthy dietary intake, lung exercises, and breathing exercises for relaxation. 2) They were asked to exchange Long COVID knowledge and participate in expressions of opinion by using communication through speaking, reading, or writing skills on the topics of Long COVID, Long COVID-19 symptom severity reduction behaviors, and communicate for others to understand by using participatory learning.

3. During week 4 to week 10, participants were reminded about healthy dietary intake, lung exercises, and relaxation exercises via the Line application. In addition, they were directed to note the dates and time spent doing lung exercises and breathing exercises for relaxation at home in the manual along with sending the recording forms once a week.

4. In week 11, an online meeting was held focusing on media literacy and decision-making skills. 1) Elderly patients received demonstrations of methods for determining media trustworthiness from trustworthy websites. 2) They were directed to analyze and determine if the media was accurate or trustworthy along with reporting methods for checking media reliability or accuracy. 3) They were directed to share trustworthy beneficial information concerning Long COVID symptom severity reduction behaviors in the group.

5. In week 12, participants were directed to exchange knowledge about practices with effects on Long COVID-19 symptom severity reduction behaviors within the group. Moreover, on



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the last day, elderly patients were directed to complete two questionnaires including the Long COVID-19 symptom severity reduction behavior questionnaire and the post-COVID-19 symptoms questionnaire.

Control Group: The participants in this group had online meetings via the Line application with VDO calls, as follows: 1) In week 1, participants compiled the demographic data questionnaire, the Long COVID literacy questionnaire, the Long COVID-19 symptom severity reduction behavior questionnaire, and the post-COVID-19 symptoms questionnaire. Moreover, they learned about COVID-19 and Long COVID incidence. 2) In week 12, they were directed to complete the Long COVID literacy questionnaire, the Long COVID-19 symptom severity reduction behavior questionnaire, and the post-COVID-19 symptoms questionnaire.

Data analysis

Data were analyzed with the SPSS computer program as follows: 1) Demographic data of the participants were analyzed using descriptive statistics by determining frequency distribution, percentages, mean scores, and standard deviation. 2) Differences in the demographic data of the experimental group and the control group were compared using the chi-square test. 3) Differences in mean scores for Long COVID-19 symptom severity reduction behaviors among participants were compared between the experimental group which received the program and the control group, after the program, using independent sample t-test statistics. 4) Differences in mean scores for Long COVID-19 symptom severity reduction behaviors among participants in the experimental group were compared before and after the program using paired sample t-test.

Results

The demographic data characteristics of the post-COVID-19 elderly participants were similar across both the experimental group and the control group. Most of the participants were female and had completed their education at the elementary level. Most were unemployed, had an income lower than 5,000 baht, and suffered from hypertension as a concomitant disease more than other diseases (Table 1).

Table1. Participant characteristics of the experimental and control group analyzed by chi-square test (n = 64)

Characteristics	Experimental group		Control group		p-value
	n = 32	n(%)	n = 32	n(%)	
Gender					0.12
Female	18	56.30	18	56.30	
Male	14	43.80	14	43.80	
Education					0.41
Unlettered	3	9.40	2	6.30	



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ผลของโปรแกรมเสริมสร้างความรอบรู้ต่อโควิด-19 ต่อพฤติกรรมลดความรุนแรง
ของอาการหลังติดเชื้อโควิด-19 ของผู้สูงอายุในชุมชน กรุงเทพมหานคร

Table1. Participant characteristics of the experimental and control group analyzed by chi-square test (n = 64) (Continue)

Characteristics	Experimental group		Control group		p-value
	n = 32	n(%)	n = 32	n(%)	
Elementary	16	50.00	15	46.90	0.38
Secondary	8	25.00	11	34.40	
Certificate	3	9.40	2	6.30	
Bachelor	2	6.30	2	6.30	
Occupation					
Unemployment	15	46.90	16	50.00	0.58
General employed	7	21.90	7	21.90	
Trade	4	12.50	6	18.80	
Company employee	4	12.50	2	6.30	
Government official	2	6.30	1	3.10	
Income (baht)					0.12
Lower than 5,000	15	46.90	16	50.00	
5,000-10,000	9	28.10	9	28.10	
10,001-15,000	8	25.00	7	21.90	0.12
Chronic disease					
No	3	9.40	3	9.40	
Hypertension	16	50.00	17	53.10	
Diabetes	11	34.40	10	31.30	0.12
Dyslipidemia	2	6.30	2	6.30	

After the program, the mean score for Long COVID-19 health literacy of the experimental group which received the Long COVID literacy enhancement program ($M = 73.25$, $SD = 8.38$) was higher than that of the control group ($M = 53.96$, $SD = 7.33$) at 19.29 points, which was a statistically significant difference ($t = 9.78$, $p < .001$). The mean score for Long COVID-19 symptom severity reduction behaviors of the experimental group after participation in the Long COVID literacy enhancement program ($M = 74.44$, $SD = 5.93$) was higher than before participation in the program ($M = 52.00$, $SD = 9.64$) at 22.44 points, which was a statistically significant difference ($p < .001$) (Table 2).



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Table 2. Comparison of mean scores and standard deviation of Long COVID health literacy scores and Long COVID-19 symptom severity reduction behaviors before and after the program for the experimental and control groups (n = 64)

	Experimental		Control		T	p-value
	M	SD	M	SD		
Long COVID health literacy scores						
- Before	54.44	12.37	59.94	9.67	-1.98	.050
- After	73.25	8.38	53.96	7.33	9.78	.000
Long COVID-19 symptom severity reduction behaviors						
- Before	52.00	9.64	53.28	8.28	-.57	.570
- After	74.44	5.93	50.38	7.96	13.70	.000

After the program, the mean score for Long COVID-19 symptom severity reduction behaviors of the experimental group (M = 74.44, SD = 5.93) was higher than that of the control group (M = 50.38, SD = 7.96) at 24.06 points, which is a statistically significant difference (t = 13.70, p < .001) (Table 3).

Table 3. Comparison of mean scores and standard deviation of Long COVID health literacy scores and Long COVID-19 symptom severity reduction behaviors after the program between the experimental and control groups (n = 64)

	Experimental		Control		t	p-value
	M	SD	M	SD		
Long COVID health literacy scores	73.25	8.38	53.96	7.33	9.78	.000
Long COVID-19 symptom severity reduction behaviors	74.44	5.93	50.38	7.96	13.70	.000

Discussion

Issue 1: Regarding mean scores for Long COVID-19 symptom severity reduction behaviors among post-COVID-19 patients in the experimental group, they had an higher average severity of symptoms behavioral score after the program with statistical significance (p < .001). The reason for this may be that the elderly participants exchanged opinions on Long COVID-19. After exchanging their experiences within the group, the experimental group were found to have higher Long COVID-19 symptom severity reduction behaviors than before the experiment. This was consistent with a study conducted by Hirunnu et al. (2021) in which the experimental group were encouraged to analyze and exchange opinions within a group about the severity of Long COVID



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symptoms and presented on the potential complications. After six weeks, the experimental group had higher COVID-19 prevention behaviors than before with statistical significance at 0.05.

Issue 2: Elderly participants in the experimental group had higher mean score for reducing severity of post-infection COVID-19 behaviors than the control group after participation in the program with statistical significance ($p < .001$) which may be due to the following three reasons:

1. The experimental group may have increasing health literacy level from the program. On the otherhand, the control group did not got these health literacy activities. The six health literacy components which included several types of activities may have provided the experimental group patients with lessons learned, real-time learning, and access to self-care information while they were infected with COVID-19. These activities may help experimental group to be more COVID-19 knowledge for reducing severity of post-infection COVID-19 than the control group. As a result, the experimental group had fewer COVID symptoms than the control group. This is consistent with the Nutbeam's concept of health literacy (2008).

2. The experimental group may have had more self-confidence than the control group. This self-confidence could have been received from the lung exercise and breathing exercise demonstrations. These exercises are easy, not complicated, and can be practiced once a day. Moreover, their exercise record help to increase their self-confidence. In addition, participants took photos and sent them via the Line application once a week. These activities helped participants improve their self-confidence, resulting in them having fewer COVID symptoms than the control group, consistent with Thepin et al. (2019) in which a program was provided to develop health literacy in patients with uncontrolled blood pressure. It was found that the experimental group of hypertensive patients had significantly higher mean scores for health literacy and self-confidence than the control group ($p < .05$).

3. The experimental group knew the benefit of good nutrition, lung exercises, and breathing exercises from the program. This was likely an important factor that helped those in the experimental group to recognize the beneficial effects of eating, lung exercise, and breathing exercises. Therefore, this useful knowledge helped the experimental group participants reduce the severity of symptoms after being infected with COVID-19 better than the control group. These findings are consistent with the research of Ganbenyapa et al. (2023) in which a yoga exercise program was provided to patients after being infected with COVID-19. It was found that the experimental group perceived the benefits of the yoga exercise at a higher level than the control group. Therefore, the experimental group showed significant increases in chest expansion and lung function compared with the control group ($p < .001$).

Recommendations

1. Community nurse practitioners and health teams should implement the Long COVID literacy enhancement program as a guideline for the care of post-COVID-19 elderly patients to reduce the severity of post-COVID-19 symptoms. This program should be used in elderly schools



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for learning about management of other issues.

2. Long COVID-19 symptom severity reduction behavior monitoring time should be increased to three to six months after the end of the program to better assess Long COVID-19 symptom severity reduction behaviors.

Recommendations for future research

The Long COVID literacy enhancement program should be used with COVID-19 patients in other target groups, such as working-aged participants or those with other chronic diseases.

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