









# Association of Social Network with Physical Function Among Community-Dwelling Older Adults in Rural Thailand: A Cross-Sectional Study

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**Purpose:** As the number of older adults in society increases, their social roles and networks, as well as their physical function, decrease. This study aimed to clarify the association between social networks and physical function among people aged  $\geq 60$  years in rural Thailand.

**Patients and Methods:** This cross-sectional study was conducted in the Photharam District, Ratchaburi Province, Thailand. Participants were required to be at least 60 years old and be able to walk to the health center. Social networks were surveyed using the Thai version of Lubben Social Network Scores-6. Four physical function measures, namely hand grip strength, five-times-sit-to-stand test, timed up-and-go (TUG) test, and one-leg standing, were considered. Regression analysis was conducted with Lubben Social Network Scores-6 as the dependent variable and the four types of physical function as independent variables.

**Results:** A total of 497 older adults aged 60 years or more were enrolled; 82 were males, and 412 were females. The mean Lubben Social Network Scores-6 was  $14.9 \pm 5.7$ . Only the TUG test was associated in a single and multiple regression analysis with the Lubben Social Network Scores-6 as the dependent variable and the four physical function assessments as independent variables.

**Conclusion:** The TUG test assessed the smoothness of normal standing and walking, which are essential physical functions for maintaining a social network and meeting people. This suggests a relationship between physical function and social network.

**Keywords:** Lubben Social Network Scores-6, social relationship, timed up-and-go test, aging

## Introduction

Population aging is a common challenge in many developed countries. The percentage of older adults (aged  $\geq 60$  years) worldwide increased from 9.2% in 1990 to 11.7% in 2013 and is expected to reach 21.2% by 2050.<sup>1</sup> Thailand is one of the fastest aging countries in Southeast Asia; in 2005, 10% of Thailand's population was over 60 years of age. A previous study showed that the number of people aged  $\geq 60$  years will reach 20% by 2050, making Thailand the second country in Southeast Asia, after Singapore, with the most aged population.<sup>2,3</sup>

One challenge with the increase in the number of older adults is the decreased roles and social networks of older adults.<sup>4-6</sup> Social networks form a web of social interactions and relationships, and older adults with limited access to these networks are at high risk of social isolation.<sup>7</sup> According to the World Health Organization (WHO), maintaining social networks is one of the most important aspects of promoting the health of older adults. Its importance during the coronavirus disease 2019 pandemic has been suggested, particularly in relation to social isolation.<sup>8</sup> According to the conceptual model proposed by Berkman et al, social networks influence health through various pathways, such as social support, social influence, social engagement, and access to resources.<sup>9</sup> In addition, previous studies have shown that

a lack of social networks among older adults is associated with various health risks, including depression, suicide, early death, development of heart disease and stroke, poor physical health, and reduced subjective well-being.<sup>10–13</sup>

Although there have been studies on social networks among older adults, few have investigated their relationship with physical function.<sup>14</sup> In general, musculoskeletal mass declines in old age, increasing the risk of frailty and sarcopenia.<sup>15–17</sup> Older adults are less active, and their physical function declines, which may result in long-term care.<sup>18–20</sup> The need for long-term care can reduce the quality of life and increase the burden on caregivers; to prevent this situation, older adults must maintain their physical function. Maintaining a strong social network may promote healthy behaviors and prevent physical function decline through interactions with others; however, this association needs to be clarified.<sup>21</sup>

In Thailand, a rapidly aging country, the association between social networks and depression has been studied relatively in detail. One study suggests that regular and frequent interaction with various social contacts may prevent geriatric depression, which is common among older adults.<sup>22</sup> However, few studies have been conducted on physical activity. Therefore, in this cross-sectional study, we aimed to determine the physical functions associated with social networks among people aged  $\geq 60$  years in rural Thailand.

## Materials and Methods

### Study Area and Participant

This cross-sectional study was conducted in the Photharam District, Ratchaburi Province, Thailand, between May 2023 and January 2024. Ratchaburi Province is approximately 100 km west of Bangkok and has ten districts, including Photharam. Photharam District has 31 health centers. This area was chosen as it is not the center of the province and has a large aging population, with the younger generation moving to urban areas for work. The health center has a function complementary to that of the hospital and has a nurse on staff. Of the 31 health centers in Photharam District, 13 participated in this study. Those aged  $\geq 60$  years who could walk to a health center were included. Exclusion criteria were neurological diseases and dementia. The health centers recruited local residents, and those who voluntarily participated were included in the study.

### Questionnaire-Based Investigation

Trained interviewers conducted the surveys through face-to-face interviews; 4–5 nurses and clerks at each health center conducted the interviews, and the survey methodology was explained in advance. The survey included the following basic information: age, sex, height, weight, presence of chronic diseases, frequency of going out, drinking history, smoking history, education level, and presence of family members living with the participants. Some basic information was obtained from previous studies, and additional items were added as necessary.<sup>23–25</sup> Social networks were surveyed using the Thai version of Lubben Social Network Scores-6 (LSNS-6).<sup>26</sup> The LSNS-6 was developed specifically for use in the older adult population and has since been widely used in both research and clinical settings.<sup>27–31</sup> It consists of six items, namely three family and three friend items. On a 5-point Likert scale, 0 = none, 1 = 1 person, 2 = 2 people, 3 = 3–4 people, 4 = 5–8 people, and 5 = 9 or more people, with higher scores indicating stronger networks. The total score was 30 points on a scale of 15 for family items and 15 for friend items, and scores  $< 12$  indicated social isolation.

### Physical Function

Four physical function measures, namely hand grip strength, five-times-sit-to-stand (FTSS) test, timed up-and-go (TUG) test, and one-leg standing, were considered in the study. All four measures were chosen from those commonly used to assess physical function in older adults based on previous studies.<sup>32,33</sup> Hand grip strength, measured using a Hand grip Dynamometer (Model no. T. K. K. 5401 GRIP-D, Takei Scientific Instruments, Niigata, Japan), was repeated twice on each side, and the highest value was used. In the FTSS test, the participant sat on a chair with arms folded, got up from the chair as quickly as possible, and then sat down again, repeating the process five times. A stopwatch was used to measure the time required by the participants to stand up from a sitting position and sit back down five times as quickly as possible (Model no. 4–3747-01, AS ONE Corporation, Osaka, Japan). In the TUG test, the participants were asked to get up from a chair, walk at a normal speed, turn at a landmark 3 m away, return, and finally sit down again. A stopwatch

was used to measure the time required by the participants to complete the task. For the one-leg stand, the participants were asked to choose the side they preferred, on the left or right, and the time from the moment they lifted one leg to the moment they set it on the floor was measured. The maximum time was limited to 60s. A stopwatch was used to measure the time required by participants to complete the task. All tests were performed by trained personnel according to standard procedures.

## Statistical Analysis

Basic information (age, sex, height, weight, presence of chronic diseases, frequency of going out, drinking history, smoking history, education level, and presence of family members living with the participants) is presented as percentage or mean  $\pm$  standard deviation. The LSNS-6 scores and physical function assessment items are presented as mean  $\pm$  standard deviation, median, and interquartile range (IQR). Single regression analysis (Model 1) was conducted with LSNS-6 scores as the dependent variable, the four types of physical function as independent variables, and unstandardized coefficients (B), standardized partial regression coefficients ( $\beta$ ), standard errors (SE), and p-values were calculated. Multiple regression analysis (Models 2 and 3) was conducted with LSNS-6 scores as the dependent variable, and unstandardized coefficients (B), standardized partial regression coefficients ( $\beta$ ), standard errors (SE), and p-values were calculated. Model 2 comprised four physical function assessment items with independent variables adjusted for age, sex, and BMI. Model 3 was added to Model 2, with the independent variables adjusted for the frequency of going out, college degree, and marital status. In addition, as a sub-analysis, the total scores for family-only and friends-only in the LSNS-6 scores were used as dependent variables, and single and multiple regression analyses were conducted using the same method. Independent variables were also analyzed using the same variables as in Models 2 and 3. Statistical analysis was performed using IBM SPSS (IBM SPSS for Windows, Inc. Version 28), with the level of statistical significance set at 5%.

## Results

### Participant Attributes

The demographics of the target population are shown in Table 1; a total of 497 older adults aged  $\geq 60$  years were enrolled; 82 were males, and 412 (83.5%) were females. The average age was  $69 \pm 7$  years, and 52.9% were in their 60s. Regarding chronic diseases, 51.3% had hypertension, and 33.1% had hyperlipidemia. Regarding the frequency of going

**Table 1** Summary of Participants' Characteristics (n=497)

			<b>N</b>	<b>%</b>
<b>Sex (n = 497)</b>	Female		415	83.5
	Male		82	16.5
<b>Age, years (n = 497)</b>	60–69		263	52.9
	70–79		188	37.8
	80-		46	9.3
		Mean $\pm$ SD	69.7 $\pm$ 6.3	
<b>BMI (n = 494)</b>		Mean $\pm$ SD	24.8 $\pm$ 4.2	
<b>Chronic disease (n = 495)</b>	No		140	28.3
	Hypertension		253	51.3
	High cholesterol		164	33.1
	Diabetes		124	25.1
	Heart disease		34	6.9
	Knee osteoarthritis		52	10.5
	Hearing loss		8	1.6
	Visual impairment		24	4.8
	Total	Mean $\pm$ SD	1.42 $\pm$ 1.25	

(Continued)

**Table 1** (Continued).

		<b>N</b>	<b>%</b>
<b>Frequency going out (= 495)</b>	Everyday	346	69.9
	6–5 times/week	28	5.6
	4–3 times/week	59	11.9
	1–2 times/week	43	8.7
	3–4 times/month	5	1
	1–2 times/month	14	2.8
	Total	Mean ± SD	5.74 ± 2.1
<b>Education level (= 495)</b>	Elementary school	345	69.7
	Junior high school	41	8.3
	High school	53	10.7
	University	56	11.3
<b>Who you live with (= 493)</b>	Alone	55	11.2
	Wife/Husband	207	42
	Son/Daughter	264	53.5
	Grandchild	110	22.3
	Brother/Sister	59	12
	Relative	11	2.2
<b>Marital status (= 497)</b>	Yes	254	51.1
	No	82	16.5
	Divorce	23	4.6
	Bereavement	138	27.8
<b>Smoking (= 497)</b>	No	464	93.4
	Yes	27	5.4
	Before	6	1.2
<b>Drinking alcohol (= 494)</b>	Yes	30	6.1
	No	464	93.9

**Abbreviation:** BMI, body mass index.

out, 69.9% of the participants went out daily, while education level showed that 69.7% had finished elementary school. Moreover, 51.1% were married, 27.8% were bereaved, and 16.5% were single; 42% lived with their spouse, and approximately 53.5% lived with their children. Most (93.9%) of the participants did not consume alcohol.

The results of LSNS-6 and physical function assessment are presented in [Table 2](#). The mean LSNS-6 score was  $14.9 \pm 5.7$ . The mean LSNS-6 score for family was  $6.9 \pm 3.1$ , while that for friends was  $7.9 \pm 3.8$ . Friend scores were approximately 1 point higher than family scores. Among the participants, 27.6% had LSNS-6 scores of  $< 12$ , classified as being in social isolation. As for the physical function values, the mean hand grip strength, FTSS, TUG, and one-leg standing values were  $23.2 \pm 6$  kg,  $10 \pm 2.6$  s,  $10 \pm 2.8$  s, and  $14.6 \pm 16.6$  s, respectively.

## Regression Analysis Results

[Table 3](#) presents the results of regression analyses. In a single regression analysis of Model 1, only the TUG test was associated with the LSNS-6 as the dependent variable and the four physical function assessments as independent variables. In the multiple regression analysis of Models 2 and 3, only the TUG test was found to be associated with the physical function assessments.

## Sub-Analysis Results

The results of the sub-analysis are presented in [Table 4](#). Only the TUG test was found to be associated with the LSNS-6 scores of friends, while none of the four physical function aspects were found to be associated with that of family members.

**Table 2** LSNS-6 and Physical Function Assessment (n=497)

			N	%
<b>LSNS-6 (n = 497)</b>	Less than 13 points (Social isolation)		137	27.6
	Total amount	Mean ± SD Median (IQR)	14.9 ± 5.7 15 (11–19)	
	-Family-only Total	Mean ± SD Median (IQR)	6.9 ± 3.1 7 (5–9)	
	-Friends-only Total	Mean ± SD Median (IQR)	7.9 ± 3.8 8 (5–11)	
<b>Physical function assessment</b>	Hand grip strength (n = 497)	Mean ± SD Median (IQR)	23.2 (± 6) 22.8 (19.4–25.8)	
	FTSS test (n = 493)	Mean ± SD Median (IQR)	10 (± 2.6) 9.7 (8.2–11.5)	
	TUG test (n = 496)	Mean ± SD Median (IQR)	10.6 (± 2.8) 10 (8.8–11.7)	
	One-leg standing (n = 495)	Mean ± SD Median (IQR)	14.6 (± 16.6) 7.2 (3.5–19.1)	

**Abbreviations:** LSNS-6, Lubben Social Network Scores-6; FTSS, five-times-sit-to-stand; TUG, timed up-and-go.

**Table 3** Regression Analysis Results

	<b>Social Network (LSNS-6) total amount (n = 497)</b>											
	<b>Model 1</b>				<b>Model 2</b>				<b>Model 3</b>			
	<b>B</b>	<b>SE</b>	<b>β</b>	<b>P value</b>	<b>B</b>	<b>SE</b>	<b>β</b>	<b>P value</b>	<b>B</b>	<b>SE</b>	<b>β</b>	<b>P value</b>
<b>Hand grip</b> (n = 497)	0.061	0.043	0.063	0.158	0.047	0.059	0.049	0.431	0.048	0.059	0.051	0.414
<b>FTSS test</b> (n = 493)	-0.182	0.098	-0.083	0.064	-0.029	0.127	-0.013	0.823	-0.039	0.127	-0.017	0.758
<b>TUG test</b> (n = 496)	-0.314	0.091	-0.153	< 0.001***	-0.289	0.121	-0.134	0.017*	-0.243	0.12	-0.112	0.044*
<b>One-leg</b> (n = 495)	0.025	0.016	0.073	0.104	0.016	0.017	0.045	0.366	0.013	0.017	-0.038	0.448

**Notes:** Model 1 - simple regression analysis. Model 2 - adjusted for Model 1 plus age, sex, BMI. Model 3 - adjusted for Model 2 plus age, sex, BMI, chronic disease total, frequency going out total, education level (University), marital status (Yes). \*p < 0.05, \*\*\*p < 0.001.

**Abbreviations:** LSNS-6, Lubben Social Network Scores-6; Hand grip, Hand grip strength; FTSS, five-times-sit-to-stand; TUG, timed up-and-go; One-leg, One-leg standing.

**Table 4** Sub-Analysis Results

	<b>Social Network (LSNS-6)-friend-only total (n = 497)</b>											
	<b>Model 1</b>				<b>Model 2</b>				<b>Model 3</b>			
	<b>B</b>	<b>SE</b>	<b>β</b>	<b>P value</b>	<b>B</b>	<b>SE</b>	<b>β</b>	<b>P value</b>	<b>B</b>	<b>SE</b>	<b>β</b>	<b>P value</b>
<b>Hand grip</b> (n = 497)	0.056	0.029	0.088	0.05	0.058	0.04	0.091	0.145	0.054	0.04	0.085	0.178
<b>FTSS test</b> (n = 493)	-0.125	0.066	-0.085	0.059	0.014	0.085	0.009	0.874	0.012	0.087	0.008	0.891
<b>TUG test</b> (n = 496)	-0.235	0.061	-0.171	< 0.001***	-0.194	0.081	-0.133	0.017*	-0.165	0.082	-0.113	0.045*
<b>One-leg</b> (n = 495)	0.021	0.01	0.089	0.048*	0.011	0.012	0.047	0.345	0.008	0.012	0.033	0.518

(Continued)

**Table 4** (Continued).

	Social Network (LSNS-6)-family-only total (n = 497)											
	Model 1				Model 2				Model 3			
	B	SE	$\beta$	P value	B	SE	$\beta$	P value	B	SE	$\beta$	P value
<b>Hand grip</b> (n = 497)	0.004	0.024	0.008	0.852	-0.011	0.032	-0.022	0.727	-0.01	0.032	-0.02	0.166
<b>FTSS test</b> (n = 493)	-0.057	0.053	-0.049	0.281	-0.042	0.069	-0.035	0.541	-0.045	0.069	-0.037	0.747
<b>TUG test</b> (n = 496)	-0.079	0.049	-0.072	0.11	-0.095	0.065	-0.082	0.145	-0.071	0.065	-0.062	0.27
<b>One-leg</b> (n = 495)	0.005	0.008	0.026	0.57	0.005	0.009	0.025	0.614	0.002	0.009	0.013	0.793

**Notes:** Model 1 - simple regression analysis. Model 2 - adjusted for Model 1 plus age, sex, BMI. Model 3 - adjusted for Model 2 plus age, sex, BMI, chronic disease total, frequency going out total, education level (University), marital status (Yes). \* $p < 0.05$ , \*\* $p < 0.001$ .

**Abbreviations:** LSNS-6, Lubben Social Network Scores-6; Hand grip, Hand grip strength; FTSS, five-times-sit-to-stand; TUG, timed up-and-go; One-leg, One-leg standing.

## Discussion

This is the first study on the association between social networks and physical function among people aged  $\geq 60$  years in rural Thailand. Few studies have been conducted on the social networks of older adults in Thailand; therefore, the present study has valuable implications for the country's increasing number of older adults. In this study, the TUG test was strongly related to social networks, indicating that social networks and physical function are associated.

The average total LSNS-6 scores among older adults in rural Thailand was 14.9. This score was lower than those reported in previous studies from Japan and Europe<sup>11,14</sup> but comparable to those reported in previous studies from Malaysia and Singapore in the same Southeast Asian region. The percentage of those classified as socially isolated with a score of less than 12 was 27%, higher than reported in other countries.<sup>29,34</sup>

The percentage of those with  $< 12$  points, classified as socially isolated, was 27%, higher than that reported from other countries.<sup>35</sup> This score varies depending on the type of environment in which people live for ease of social connection, and as noted in past studies, the main reason for the lower social network score is the lack of developed social infrastructure in rural areas of Thailand.<sup>36</sup> The physical function values were comparable to those reported in previous studies from Thailand and represent the physical function of older adults in the country.<sup>24,37-39</sup>

In this study, only the TUG test was associated with the LSNS-6 scores and physical function in single and multiple regression analyses. TUG test assesses the smoothness of normal standing and walking, an important physical function in maintaining an appreciable social network and meeting people. Previous studies have reported that the TUG test is associated with the LSNS-6 scores.<sup>40</sup> However, hand grip strength, FTSS test, and one-leg standing were not associated with those in the LSNS-6 scores. A possible reason is that hand grip strength is primarily an upper-extremity muscle strength and is not significantly involved in mobility.<sup>41</sup> The FTSS test is primarily a measure of instantaneous force and is not considered to be related to meeting people.<sup>42</sup> One-leg standing primarily assesses balance ability, which is considered a greater factor in fall prevention than mobility.<sup>43</sup> In previous studies on the association between physical function and the LSNS-6 scores, both TUG and FTSS were found to be associated with the LSNS-6 scores; however, in the current study, only the TUG test was related to the LSNS-6 scores.<sup>44</sup> The reason for this, as noted in previous studies, was that the TUG test is a measure that reflects the activities of daily living, especially since it includes tasks such as standing and changing direction, compared to the other measures.<sup>45</sup> Therefore, only TUG test results were associated in the present study.

Regression analysis of the LSNS-6 scores with friends and family members in the sub-analysis (Table 3) resulted in only the LSNS-6 scores of friends being related to physical function; the LSNS-6 scores of the family were not associated with physical function. Older adults are expected not to be able to meet their friends unless they maintain high physical function. Previous studies in other countries have shown similar results, indicating that a low friend network, compared to a low family network, significantly impacts the physical function of older adults, consistent with the present study's results.<sup>46</sup> Overall, maintaining a smooth level of walking and standing movements, especially regarding friendships, was associated with maintaining a high level of social networking.

In the present study, social networks were indicated in relation to family and friends, and friendship scores were particularly associated with physical function. Since this was a cross-sectional study, examining the causal relationships or underlying mechanisms was not possible. However, maintaining physical function was thought to allow people to maintain relationships with friends. In reality, “meeting with friends” involves movement, which involves exercise and the maintenance of physical function. Accordingly, we believe that for people to enjoy meeting with friends, they need to maintain their physical function. Previous studies have suggested that having friends through increased physical activity could help prevent and manage the onset of frailty in older adults.<sup>19</sup> However, as shown in previous studies, there are very few places or environments in Thailand where older adults can easily get together.<sup>47</sup> Moreover, means of transportation are lacking, making it difficult for them to get there, if at all; therefore, as physical function declines, people tend to stay indoors. In the future, the local government should take the initiative to create places where older adults can easily gather and provide transportation, such as a shuttle service while increasing support to maintain social networks.

This study has several limitations. First, participants were predominantly women since most participants in such activities in Thailand are women. Second, since the participants were asked to gather voluntarily, they were expected to have some confidence in their physical function. Hence, it is possible that only those who maintained high social network levels participated in the program. Future studies should include more men and evaluate the relationship between social networks and physical function. Furthermore, in future studies, the investigator should visit older adults in their homes and perform the test on those not confident in their physical functions. Third, although the data were collected in Photharam District, Ratchaburi Province, which is representative of Thailand’s rural areas, there are many different rural areas in Thailand, and the results may not be representative of all of them. Similar studies at various locations would be recommended in the future. Fourth, although four types of physical function assessments were conducted in this study, there are many other assessment methods as well. In the future, the multifaceted physical function of older adults in Thailand will need to be assessed.

The strength of this study was that it is one of the few studies that investigated social networks and physical function in a rural area of Thailand on a 500-person scale. We hope that further studies on social networks and physical function will be conducted on older adults in Thailand using this study as a reference.

## Conclusion

In this study, the TUG test was strongly related to social networks, indicating that social networks and physical function are associated. The TUG test assessed the smoothness of normal standing and walking, which are essential physical functions for maintaining a social network and meeting people. This suggests a relationship between physical function and social network.

## Data Sharing Statement

Data supporting the findings of this study are available from the corresponding author upon request.

## Ethical Approval and Informed Consent

This study was approved by the Ethics Committee of Juntendo University (approval no. E23-0017) and was conducted according to the tenets of the Declaration of Helsinki. Permission and approval were also obtained from the health centers involved in Thailand. All older adults participated voluntarily and provided written informed consent.

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## Disclosure

The authors declare no conflict of interest.

## References

1. United Nations. [homepage on the Internet]. World population ageing report 2013. Available from: <https://www.un.org/esa/socdev/documents/ageing/Data/WorldPopulationAgeingReport2013.pdf>. Accessed June 8, 2024.
2. Tantirat P, Suphanchaimat R, Rattanathumsakul T, Noree T. Projection of the number of elderly in different health states in Thailand in the next ten years, 2020-2030. *Int J Environ Res Public Health*. 2020;17(22):8703. doi:10.3390/ijerph17228703
3. Suriyanrattakorn S, Chang CL. Long-term care (LTC) policy in Thailand on the homebound and bedridden elderly happiness. *Health Policy Open*. 2021;2:100026. doi:10.1016/j.hpopen.2020.100026
4. Cornwell B, Laumann EO, Schumm LP. The social connectedness of older adults: a national profile\*. *Am Sociol Rev*. 2008;73(2):185–203. doi:10.1177/000312240807300201
5. Sujiv A, Kalaiselvi S, Tiwari MK, Deshmukh P. Social isolation, social support, and psychological distress among the elderly during the COVID-19 pandemic: a cross-sectional study from central India. *Indian J Public Health*. 2022;66(4):451–457. doi:10.4103/ijph.ijph\_482\_22
6. Wang X, Zhang X, Luan W. Social isolation, depression, nutritional status and quality of life during COVID-19 among Chinese community-dwelling older adults: a cross-sectional study. *BMJ Open*. 2023;13(9):e072305. doi:10.1136/bmjopen-2023-072305
7. Miyashita J, Yamamoto Y, Shimizu S, et al. Association between social networks and discussions regarding advance care planning among Japanese older adults. *PLoS One*. 2019;14(3):e0213894. doi:10.1371/journal.pone.0213894
8. World Health Organization [homepage on the Internet]. Social isolation and loneliness among older people: advocacy brief. 2021. Available from: <https://iris.who.int/bitstream/handle/10665/343206/9789240030749-eng.pdf?sequence=1>. Accessed June 8, 2024.
9. Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. *Soc Sci Med*. 2000;51(6):843–857. doi:10.1016/s0277-9536(00)00065-4
10. Kishi R, Horikawa N. Role of the social support network which influences age of death and physical function of older adults: study of trends in and outside of Japan and future problems. *Nihon Koshu Eisei Zasshi*. 2004;51(2):79–93. Japanese (Abstract in English). doi:10.11236/jph.51.2\_79
11. Lubben J, Blozik E, Gillmann G, et al. Performance of an abbreviated version of the Lubben Social Network Scale among three European community-dwelling older adult populations. *Gerontologist*. 2006;46(4):503–513. doi:10.48350/19301
12. Shiovitz-Ezra S, Litwin H. Social network type and health-related behaviors: evidence from an American national survey. *Soc Sci Med*. 2012;75(5):901–904. doi:10.1016/j.socscimed.2012.04.031
13. Watt RG, Heilmann A, Sabbah W, et al. Social relationships and health related behaviors among older US adults. *BMC Public Health*. 2014;14(1):533. doi:10.1186/1471-2458-14-533
14. Sakurai R, Kawai H, Suzuki H, et al. Poor social network, not living alone, is associated with incidence of adverse health outcomes in older adults. *J Am Med Dir Assoc*. 2019;20(11):1438–1443. doi:10.1016/j.jamda.2019.02.021
15. Dowling P, Gargan S, Zweyer M, et al. Proteomic reference map for sarcopenia research: mass spectrometric identification of key muscle proteins located in the sarcomere, cytoskeleton and the extracellular matrix. *Eur J Transl Myol*. 2024;34(2). doi:10.4081/ejtm.2024.12564
16. Maccarone MC, Caregnato A, Regazzo G, et al. Effects of the full-body in-bed gym program on quality of life, pain and risk of sarcopenia in elderly sedentary individuals: preliminary positive results of a Padua prospective observational study. *Eur J Transl Myol*. 2023;33(3). doi:10.4081/ejtm.2023.11780
17. Quadrelli M, Baccaglioni T, Morra A. Quantitative 3D-CT imaging of sarcopenia mitigation in the elderly: evidence from a case report. *Eur J Transl Myol*. 2024;34(2). doi:10.4081/ejtm.2024.12715
18. Ng LP, Koh YLE, Tan NC. Physical activity and sedentary behavior of ambulatory older adults in a developed Asian community: a cross-sectional study. *Singapore Med J*. 2020;61(5):266–271. doi:10.11622/smedj.2020022
19. Chen T, Honda T, Chen S, Kishimoto H, Kumagai S, Narazaki K. Potential utility of physical function measures to improve the risk prediction of functional disability in community-dwelling older Japanese adults: a prospective study. *BMC Geriatr*. 2021;21(1):476. doi:10.1186/s12877-021-02415-3
20. Phetsitong R, Vapattanawong P, Sunpuwan M, Völker M. State of household need for caregivers and determinants of psychological burden among caregivers of older people in Thailand: an analysis from national surveys on older persons. *PLoS One*. 2019;14(12):e0226330. doi:10.1371/journal.pone.0226330
21. Imamura K, Kamide N, Sakamoto M, Sato H, Shiba Y, Matsunaga A. Association between social network and physical function in community-dwelling older adults in Japan. *Phys Ther Res*. 2020;23(2):153–159. doi:10.1298/ptr.E10028
22. Aung MN, Moolphate S, Aung TN, Katonyoo C, Khamchai S, Wannakrairot P. The social network index and its relation to later-life depression among the elderly aged ≥80 years in Northern Thailand. *Clin Interv Aging*. 2016;11:1067–1074. doi:10.2147/CIA.S108974
23. Thinuan P, Siviroj P, Lertrakarnnon P, Lorga T. Prevalence and potential predictors of frailty among community-dwelling older persons in Northern Thailand: a cross-sectional study. *Int J Environ Res Public Health*. 2020;17(11):4077. doi:10.3390/ijerph17114077
24. Sri-On J, Fusakul Y, Kredarunsooksree T, Paksopis T, Ruangsiri R. The prevalence and risk factors of sarcopenia among Thai community-dwelling older adults as defined by the Asian Working Group for Sarcopenia (AWGS-2019) criteria: a cross-sectional study. *BMC Geriatr*. 2022;22(1):786. doi:10.1186/s12877-022-03471-z
25. Khongsri N, Tongsutud S, Limampai P, Kuptniratsaikul V. The prevalence of sarcopenia and related factors in a community-dwelling elders Thai population. *Osteoporos Sarcopenia*. 2016;2(2):110–115. doi:10.1016/j.afos.2016.05.001
26. Thanakwang K. Social networks and social support influencing health-promoting behaviors among Thai community-dwelling elderly. *Pac Rim Int J Nurs Res*. 2008;12(4):243–258.
27. Jang Y, Powers DA, Park NS, Chiriboga DA, Chi I, Lubben J. Performance of an abbreviated Lubben social network scale (LSNS-6) in three ethnic groups of older Asian Americans. *Gerontologist*. 2022;62(2):e73–e81. doi:10.1093/geront/gnaa156
28. Stuck AE, Walthert JM, Nikolaus T, Büla CJ, Hohmann C, Beck JC. Risk factors for functional status decline in community-living older adults: a systematic literature review. *Soc Sci Med*. 1999;48(4):445–469. doi:10.1016/s0277-9536(98)00370-0



29. Lane AP, Hou Y, Hooi Wong C, Yuen B. Cross-sectional associations of neighborhood third places with social health among community-dwelling older adults. *Soc Sci Med.* 2020;258:113057. doi:10.1016/j.socscimed.2020.113057
30. Moormann KI, Pabst A, Bleck F, et al. Social isolation in the oldest-old: determinants and the differential role of family and friends. *Soc Psychiatry Psychiatr Epidemiol.* 2024;59(6):979–988. doi:10.1007/s00127-023-02524-x
31. Makizako H, Shimada H, Doi T, et al. Age-dependent changes in physical performance and body composition in community-dwelling Japanese older adults. *J Cachexia, Sarcopenia Muscle.* 2017;8(4):607–614. doi:10.1002/jcsm.12197
32. Doi T, Tsutsumimoto K, Nakakubo S, et al. Physical performance predictors for incident dementia among Japanese community-dwelling older adults. *Phys Ther.* 2019;99(9):1132–1140. doi:10.1093/ptj/pzz077
33. Izawa KP, Shibata A, Ishii K, Miyawaki R, Oka K. Associations of low-intensity light physical activity with physical performance in community-dwelling elderly Japanese: a cross-sectional study. *PLoS One.* 2017;12(6):e0178654. doi:10.1371/journal.pone.0178654
34. Hamid TA, Din HM, Bagat MF, Ibrahim R. Do living arrangements and social network influence the mental health status of older adults in Malaysia? *Front Public Health.* 2021;9:624394. doi:10.3389/fpubh.2021.624394
35. Uno C, Okada K, Matsushita E, Satake S, Kuzuya M. Friendship-related social isolation is a potential risk factor for the transition from robust to prefrailty among healthy older adults: a 1-year follow-up study. *Eur Geriatr Med.* 2021;12(2):285–293. doi:10.1007/s41999-020-00422-y
36. Henry CJ, Webster-Gandy J, Varakamin C. A comparison of physical activity levels in two contrasting elderly populations in Thailand. *Am J Hum Biol.* 2001;13(3):310–315. doi:10.1002/ajhb.1054
37. Thaweewannakij T, Wilaichit S, Chuchot R, et al. Reference values of physical performance in Thai older adults who are functioning well and dwelling in the community. *Phys Ther.* 2013;93(10):1312–1320. doi:10.2522/ptj.20120411
38. Assantachai P, Muangpaisan W, Intalapaporn S, Sitthichai K, Udompunturak S. Cut-off points of quadriceps strength, declines and relationships of sarcopenia-related variables among Thai community-dwelling older adults. *Geriatr Gerontol Int.* 2014;14 Suppl 1(S1):61–68. doi:10.1111/ggi.12207
39. Yuenyongchaiwat K, Akekawatchai C. Prevalence and incidence of sarcopenia and low physical activity among community-dwelling older Thai people: a preliminary prospective cohort study 2-year follow-up. *PeerJ.* 2022;10:e13320. doi:10.7717/peerj.13320
40. Imamura K, Kamide N, Ando M, Sato H, Sakamoto M, Shiba Y. Social isolation is associated with future decline of physical performance in community-dwelling older adults: a 1-year longitudinal study. *Aging Clin Exp Res.* 2022;34(6):1391–1398. doi:10.1007/s40520-021-02050-3
41. Pothisiri W, Prasitsiriphon O, Saikia N, Aekplakorn W. Education and grip strength among older Thai adults: a mediation analysis on health-related behaviours. *SSM Popul Health.* 2021;15:100894. doi:10.1016/j.ssmph.2021.100894
42. Gao SY, Xia Y, Wu QJ, Chang Q, Zhao YH. Reference values for five-repetition chair stand test among middle-aged and elderly community-dwelling Chinese adults. *Front Med.* 2021;8:659107. doi:10.3389/fmed.2021.659107
43. Sourdet S, van Kan GA, Soto ME, et al. Prognosis of an abnormal one-leg balance in community-dwelling patients with Alzheimer’s disease: a 2-year prospective study in 686 patients of the REAL.FR study. *J Am Med Dir Assoc.* 2012;13(4):407.e1–e6. doi:10.1016/j.jamda.2011.11.003
44. Foong HF, Ibrahim R, Hamid TA, Haron SA. Social networks moderate the association between physical fitness and cognitive function among community-dwelling older adults: a population-based study. *BMC Geriatr.* 2021;21(1):679. doi:10.1186/s12877-021-02617-9
45. Makizako H, Shimada H, Doi T, et al. Predictive cutoff values of the five-times sit-to-stand test and the timed “up & go” test for disability incidence in older people dwelling in the community. *Phys Ther.* 2017;97(4):417–424. doi:10.2522/ptj.20150665
46. Takase M, Takahashi K, Ogino R, et al. Functional capacity in community-dwelling older adults maintained by a higher friend network than family network: implications from a two-year longitudinal study. *BMC Res Notes.* 2022;15(1):319. doi:10.1186/s13104-022-06216-8
47. Tuttle D, Griffiths J, Kaunnil A. Predictors of caregiver burden in caregivers of older people with physical disabilities in a rural community. *PLoS One.* 2022;17(11):e0277177. doi:10.1371/journal.pone.0277177

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