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ORIGINAL RESEARCH

Yoga Practice as a Potential Sarcopenia Prevention Strategy in Indonesian Older Adults: A Cross-Sectional Study

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Background: Sarcopenia is characterized by the progressive loss of skeletal muscle mass and poses a significant health challenge for older adults by increasing the risk of disability and decreasing quality of life. Yoga considers as a low-risk and beneficial exercise for older adults. This research aims to evaluate the potential of yoga practice as a preventive strategy against sarcopenia in Indonesian older adults.

Methods: An observational cross-sectional research was conducted including 41 older adults aged 60–87 years. The research focused on key biomarkers and functional assessments, including serum insulin-like growth factor 1 (IGF-1) levels, telomere length, gait speed, hand grip strength, and SARC-F questionnaire scores.

Results: The results showed that participants aged 71–80 years who practiced yoga for more than a year had significantly higher IGF-1 levels (p=0.04). While improvements in gait speed, hand grip strength, and SARC-F scores were observed, these changes were not statistically significant, and no significant differences were found in telomere length.

Conclusion: Yoga in older adults was associated with higher IGF-1 levels and potential improvements in upper and lower extremity strength, though these findings were not statistically significant and did not influence telomere length. Yoga practice shows potential as an emerging adjuvant option but can not be applied as a single strategy for sarcopenia prevention in older adults.

Keywords: aging, frailty, quality of life, yoga

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Introduction

Over the past century, the global prevalence of senior citizens has increased with cases of disability. The aging process is influenced by different factors, such as nutritional intake, hygiene, physical activity, healthcare services, education, and socioeconomic status.[1] Indonesian Government Regulation No. 43 of 2004 defines older adults as individuals aged 60 and above. In 2023, the number of older adults reached 29 million (12% of the population) and is expected to rise to 40.95 million by 2030. Therefore, programs should be developed to prevent disabilities in the demographic.[2]

Sarcopenia, a progressive loss of skeletal muscle mass and strength, is a significant health concern among older adults.[3] This condition increases the risk of frailty, falls, and disability, and is associated with poor quality of life with higher mortality rates.[4] Sarcopenia leads to disability and results in a trauma known as Fear of Falling (FOF), which is a major health concern for older adults. More than one-third of older adults experience a fall each year, and the injuries present significant health and safety challenges.[5,6] In Indonesia, with the rapidly aging population, the prevalence of sarcopenia is a growing public health challenge.

Existing evidence highlights the importance of exercise and physical activity as effective strategies for mitigating sarcopenia. Resistance training, aerobic exercises, and balance-focused activities have been shown to improve muscle mass, strength, and overall physical function in older adults.[7] Studies have demonstrated that regular physical activity can

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reduce the risk of falls, enhance functional independence, and improve the quality of life among the elderly.[8] Furthermore, physical activity is associated with increased IGF-1 levels, reduced inflammation, and improved muscle mitochondrial function, all of which are key factors in combating sarcopenia.[9] These findings underscore the potential of targeted physical interventions as a preventive approach.

Aging affects the mass and strength of skeletal muscle through various factors, including hormonal changes, decreased levels of growth hormones and insulin-like growth factor 1 (IGF-1), chronic inflammation, and atherosclerosis, which induce muscle hypoxia. Additionally, factors such as a lack of physical activity, reduced 25(OH) vitamin D levels, and mitochondrial dysfunction contribute to muscle decline.[10] IGF-1 also plays a crucial role in muscle growth and development, and serum levels are considered a biomarker for sarcopenia.[11] Telomere length, a marker of cellular aging, has also been connected to muscle health. The shorter telomere potentially shows an increased risk of sarcopenia.[12] Functional assessments such as the gait speed test, hand grip strength, and SARC-F questionnaire are commonly used to evaluate physical performance and diagnose the condition in older adults.[13]

Yoga is an ancient practice originating in India and has offered various health benefits, including improved muscle strength, flexibility, and balance. The focus on low-impact physical activity including muscle strength and balance exercise, mindfulness, and breathing methods increases the accessibility form of exercise for older adults.[14] Previous research showed that regular practice can increase the levels of cytokines and myokines to maintain immunity,[14] improve muscle balance, coordination, strength, and flexibility, as well as slow the aging process.[15,16] Additionally, exercise has been shown to enhance the secretion of hormones such as IGF-1 in older adults since yoga serves as a preventive strategy against sarcopenia.[17]

Despite these benefits, a significant research gap remains that most studies on exercise interventions for sarcopenia prevention have focused on resistance training and aerobic activities that require specialized equipment, such as elliptical machines, treadmills, and stationary bicycles. These options may not be accessible to all older adults, particularly those in low-resource settings. In contrast, limited attention has been given to yoga, especially regarding its impact on biomarkers like IGF-1 and telomere length, as well as functional assessments in older adults. Due to its simplicity, low risk, and minimal equipment requirements, yoga presents a promising alternative as an accessible preventive strategy against sarcopenia, particularly in resource-constrained environments. This study aims to explore the potential of yoga practice in addressing sarcopenia among Indonesian older adults, with a focus on its effects on biomarkers and functional performance.

Methods

Research Design

An observational cross-sectional research was conducted on 41 older adults. Informed consent was completed and signed by all participants accompanied by witnesses. This research was approved by the Universitas Padjadjaran Research Ethics Committee, number 170/UN6.KEP/EC/2019 on 15th February 2019. The study complies with the principles outlined in the Declaration of Helsinki.

Participants

Socially active older adults aged 60 and above from yoga and social communities in Jakarta and Bandung participated in the research. Open recruitment was conducted through advertisements in local yoga communities and senior citizen groups in both cities. Participants were asked to come independently to the data collection sites. Yoga Group was defined as older adults who had practiced yoga for more than a year. Meanwhile, Non-Yoga Group consisted of older adults who had not practiced yoga or other high-intensity exercises for over a year. Participants with cancer, autoimmune diseases (such as rheumatoid arthritis or lupus), or conditions affecting inflammation (with hsCRP >10 mg/dL), as well as liver impairment (AST/ALT levels more than twice the normal value), were excluded. Cancer and liver impairment were excluded due to their potential effects on IGF-1 levels,[18,19] while autoimmune diseases were excluded as they may significantly impact inflammation levels and other measured outcomes.[20,21] Inflammaging (low-grade chronic inflammation associated with aging) was not considered an exclusion criterion. Consecutive sampling was conducted from June 2019 to June 2020 and the participants were asked to complete a questionnaire. Blood was drawn from the cubital vein for biomarker assays and was followed by a hand grip and a gait speed test.

The calculation of the minimum sample size is based on the prevalence of elderly people (≥60 years) in Indonesia in 2019, which is 9.6%,[22] using the proportion estimation formula with the following formula:[23]

$$n = \frac{z^2 \,.\, p \,.(1-p)}{d^2}$$

$$n = \frac{1.96^2 \,.\, 0.096 \,.\, (1-0.096)}{0.01^2}$$

Description:

n = minimum number of samples

z = *Z* score at 95% confidence = 1.96

p = maximum estimate/prevalence estimate

d = error rate (at 10%).

Based on this formula, the calculation obtained is 33.33 and rounded up to 34. By taking an estimated drop-out of 20%, the subjects who will be recruited in this study are 41 subjects. Participant's flow can be seen in Figure 1.

Intervention and Physical Activity Levels

The intervention in this study involved a Basic Hatha Yoga practice, which consisted of a series of asanas such as sun salutation, side angle, warrior 1 and 2, cat and cow, bird dog, side bend, simple twist, a modified chair pose with a wider leg stance, and tree pose. The yoga sessions were conducted once a week, lasting 60 minutes per session, and did not include inversion poses. This style of yoga was chosen for its accessibility and suitability for older adults, focusing on improving flexibility, strength, and balance without the high risks associated with more advanced or intense poses.

The high-intensity exercise group participated in activities performed at 80–95% of their maximum heart rate. These exercises aimed to improve cardiovascular fitness and muscle strength. The control group was instructed to engage in light physical activity, primarily a morning walk of approximately 30 minutes per day, with no other structured exercise involved. Participants in the non-yoga group did not engage in other high-intensity exercises or structured physical activities outside of their daily walking routine.

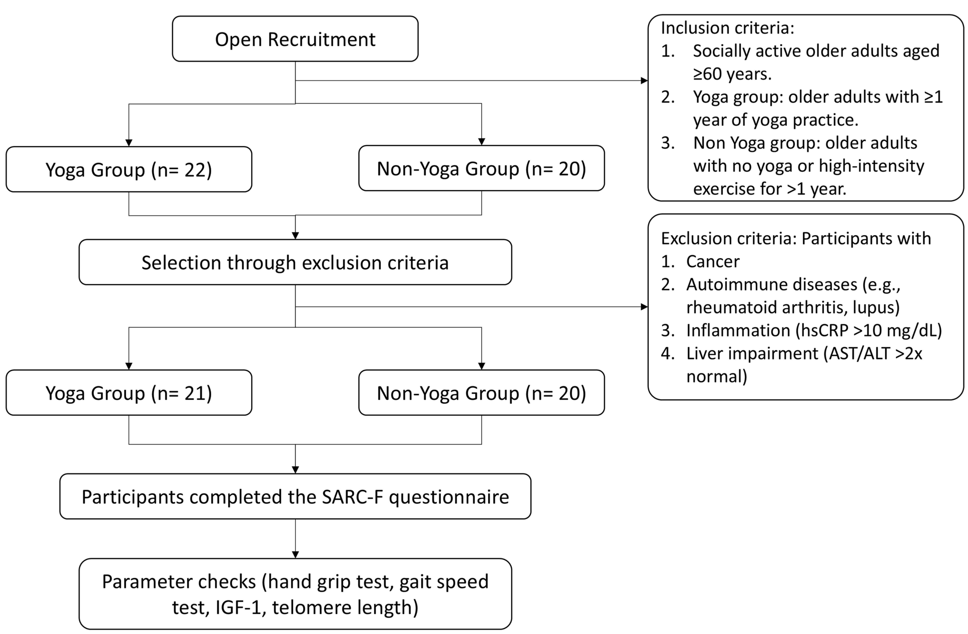

Figure 1 Participants' Flow.

SARC-F Questionnaire

Participants, accompanied by one family member, were interviewed using five questions from SARC-F Questionnaire. A score of 0 and 10 showed zero and the highest risk of sarcopenia. The questionnaire is provided in Supplementary Table 1, respectively.

Hand Grip Test (Upper Body Strength Test)

The participants were asked to stand with arms at the sides without touching the body. A digital hand dynamometer (CAMRY, China) was held in the dominant hand, and the participant was instructed to squeeze the dynamometer with maximum force. The dominant hand was defined as the hand that the participant prefers to use for tasks requiring skill, such as writing, coloring, eating, and cutting. This is also commonly referred to as a person's handedness or hand preference. Participants were asked to indicate their dominant hand before performing the test to ensure accurate assessment. A total of three trials were conducted, with a pause of about 10–20 seconds, and the results were recorded in kilograms. An additional trial was performed when the results between trials differed by more than 3 kg, with the lowest value considered an outlier. Participants were allowed to attempt a trial squeeze before the test. Low muscle strength was defined as hand grip strength of <28 kg and <18 kg for men and women, respectively.[24]

Gait Speed Test (Lower Body Strength Test)

The gait speed test scheme is in Supplementary Figure 1 where there are four brightly colored tapes fixed on the floor. The first tape was positioned 1 meter away from the second and the third was 1 meter away from the deceleration zone. The testing zone was between the second and third tapes, spanning a distance of four meters. The participant was instructed to start walking at a natural pace from the start tape to the finish. The time was recorded between the second and third tapes. In addition, the Gait Speed Test was calculated as the distance of 4 meters divided by the walking time in seconds (m/s).

IGF-1

A sample was collected using a serum separator tube (SST) and allowed to clot for 30 minutes at room temperature before centrifugation for 15 minutes at 1000 × g. Subsequently, the serum was removed and stored at −20°C. The IGF-1 serum level was measured using enzyme-linked immunosorbent assay (ELISA) methods (Quantikine® ELISA Human IGF-I Immunoassay, R&D Systems, catalogue number DG100).

Telomere Length

Telomere are repetitive sequences of TTAGGG, which protect the DNA from degradation and maintain chromosome stability.[25] The length varies between individuals, and with each cell division, telomere are not fully replicated due to the limitations of polymerases in completing the replication of the ends of linear molecules. Therefore, telomere shorten with each round of cell division.[26] The length becomes shorter with increased age, and the cell is arrested in senescence at a critical point.[27] Some research found a correlation between shortened telomere and regenerative diseases, including sarcopenia.[28,29]

Telomere length was measured by real-time kinetic quantitative PCR (qPCR) method (CFX96 Real-Time System, Bio-Rad), as described by Cawthon.[30] This method measures the amount of telomeric DNA (T) and compares the concept to a single copy gene for each sample. The T/S ratio is calculated by comparing the relative amounts of "T" and "S" to a referenced genomic DNA sample. Therefore, T/S = one, when the unknown DNA is identical to the reference in the ratio of telomere repeat copy number. A master mix was prepared to be quantified by PCR using three primers for detecting telomere (T), 36B4U, and beta-globin (S). The 'T' and 'S' reactions were performed in the same 96-well plates. Each sample was measured using AmpliTaq DNA Polymerase reagent in 25μL of dilution comprising 1X PCR Buffer Amplitaq Gold 360 Buffer, 1.5 mm $MgCl_2$ added with 0.8 mm dNTP, 0.4 μL of each forward and reverse primer, 0.5 U Taq DNA Polymerase, 1μM Syto9 (Invitrogen), and 5 μL template (DNA extract, with sterile dH_2O as a negative control). Meanwhile, the primer sequences were telomere forward (5′-CGG TTT GTT TGG GTT TGG GTT TGG GTT TGG GTT TGG GTT), telomere reverse (5′- GGC TTG CCT TAC CCT TAC CCT TAC CCT TAC CCT TAC CCT), beta-globin forward (5′-GCA GGA GCC

AGG GCT GGG CAT AAA AGT CA), beta-globin reverse (5′-GGG CCT CAC CAC CAA CTT CAT CCA CGT TC), 36B4U forward (5'- CAG CAA GTG GGA AGG TGT AAT CC-3), and 36B4U reverse (5'- CCC ATT CTA TCA TCA ACG GGT ACA A-3').[30,31] Amplification was performed on a CFX96 (Bio-Rad) instrument. The cycling condition started with enzyme activation at 95°C for 10 min, followed by 40 cycles of 95°C for 15s for denaturation and 57°C for 30s for annealing, continued with 72°C for 30s extension and one cycle of conditioning for 7 min at 72°C.

High Sensitive C-Reactive Protein (hsCRP), Aspartate Transaminase (AST) and Alanine Transaminase (ALT)

A blood sample was collected using a serum separator tube (SST) and allowed to clot for 30 minutes at room temperature before centrifugation for 15 minutes at 1000 × g. Subsequently, serum was removed with hsCRP, AST, and ALT serum levels measured as parameters for exclusion. HsCRP was measured using chemiluminescent immunoassay methods with Immulite 2000 Ferritin reagent (Cat. L2KFE2) on the Sysmex XN-series (PT Sysmex Indonesia). AST and ALT were measured by IFCC without Pyridoxal-5-phosphate (P5P) using spectrophotometry on ARCHITECT cSYSTEMS (Abbott, Illinois, USA).

Statistical Analysis

IBM SPSS software v.22 (United States) was used for statistical analyses and significance was determined at a 5% level. The general data description was presented as frequency, minimum, maximum, mean ± SD, and median value. Normality of the data was tested using the Kolmogorov–Smirnov test. Comparisons between group medians were conducted using the Mann–Whitney *U*-test. A Spearman correlation test was performed to assess the correlation between each parameter.

Results

A total of 42 participants enrolled, but one subject was excluded due to a high hsCRP value. Meanwhile, 20 and 21 Non-Yoga and Yoga participants with normal values of hsCRP, AST, and ALT, with no record of cancers proceeded to the next measurements. In the Yoga group, there were 14 males and 7 females, while the Non-Yoga group consisted of 6 males and 14 females. The average age of the Non-Yoga and Yoga group was 66.10 ± 4.04 and 72.62 ± 7.08 years, respectively. We performed open recruitment by advertising in yoga and senior communities, which provided a fair opportunity for all older adults to participate. Data collection was conducted at our center, and all participants were required to independently come to the center. We assume that only healthier older adults, who are physically capable of independent travel, could attend the data collection center. As a result, the yoga group, which tends to be more physically active, was generally older than the non-yoga group. The youngest and oldest subjects in this research were 60 and 87 years old, respectively. Participant characteristics are shown in Table 1. Participants' characteristics after grouping by age are shown in Table 2.

Table 1 Participants' Characteristics

Parameters	All participants (n = 41)		Non-Yoga (n = 20)		Yoga (n = 21)	
	Mean	SD	Mean	SD	Mean	SD
Age (years old)	69.44	6.61	66.10	4.04	72.62	7.08
hsCRP (mg/L)	1.62	1.56	1.87	1.79	1.39	1.29
AST (U/L)	20.59	5.66	19.95	4.79	21.19	6.44
ALT (U/L)	22.34	7.52	20.10	5.91	24.48	8.38
IGF-1 (ng/mL)	83.24	28.20	83.60	35.35	82.90	20.07
T/S Ratio	0.77	0.22	0.77	0.27	0.77	0.02
Gait speed (m/s)	1.01	0.27	0.97	0.21	1.05	0.32
Hand Grip (Kg)	27.68	22.57	23.00	6.14	25.40	11.24

Abbreviations: hsCRP, high sensitive C-reactive protein; AST, aspartate aminotransferase; ALT, alanine aminotransferase; IGF-1, Insulin-like Growth Factor-1; T/S ratio, telomeric DNA/beta-globin single copy gene ratio.

Table 2 Participants' Characteristics After Grouping by Age

Group	Age		IGF-1 (ng/mL)	T/S ratio	Gait Speed (m/s)	Hand Grip (Kg)
Non-Yoga	60–70 y.o (n = 18)	Mean	88.28	0.76	1.00	23.82
		SD	34.11	0.03	0.20	5.91
		Median	82.50	0.77	0.99	23.18
		Min	55.00	0.68	0.68	10.80
		Max	191.00	0.80	1.51	34.30
	71–80 y.o (n = 2)	Mean	41.50	0.77	0.73	15.60
		SD	4.95	0.01	0.18	0.14
		Median	41.50	0.77	0.73	15.60
		Min	38.00	0.76	0.60	15.50
		Max	45.00	0.78	0.85	15.70
Yoga	60–70 y.o (n = 11)	Mean	85.00	0.76	1.10	29.44
		SD	19.76	0.02	0.41	13.39
		Median	92.00	0.76	1.02	25.40
		Min	51.00	0.74	0.64	17.00
		Max	110.00	0.80	2.17	63.70
	71–80 y.o (n = 6)	Mean	90.83	0.78	0.93	22.15
		SD	16.67	0.01	0.19	5.23
		Median	93.00	0.77	0.91	22.65
		Min	69.00	0.75	0.75	14.50
		Max	117.00	0.80	1.25	29.50
	>80 y.o (n = 4)	Mean	65.25	0.77	1.12	19.15
		SD	19.07	0.01	0.09	8.13
		Median	64.00	0.77	1.09	17.85
		Min	44	75	1.04	10.90
		Max	89	78	1.25	30.00

The mean age of the Non-Yoga and Yoga groups was 66.10 ± 4.04 and 72.62 ± 7.08 years, respectively. Due to the age gap, the participants were divided into three groups based on age decades (60–70 y.o, 71–80 y.o, and >80 y.o). Most of the participants were aged between 60 and 70 years as reported in Table 2. The data were not normally distributed and the median value was used rather than the mean. A gait speed of 0.6 meters per second (m/s) or slower can be regarded as having a higher risk of sarcopenia. All subjects in this study showed gait speed of >0.6 m/s.[32]

The Mann–Whitney *U*-test (Table 3) showed a significant difference in IGF-1 levels for participants aged 71–80 years (p = 0.04). However, higher IGF-1 values, gait speed, and hand grip strength were observed in the Yoga group compared to the Non-Yoga group, while the T/S ratio was similar in both, as shown in Figure 2. Non-Yoga group had no participants older than 80 years, hence the comparison was conducted within the age range. The results showed no significant correlation between all parameters.

Table 3 Differences Between Non-Yoga vs Yoga Group

Parameters	Age 60–70 y.o			Age 71–80 y.o		
	Non-Yoga	Yoga	*P* value	Non-Yoga	Yoga	*P* value
IGF-1 (ng/mL)	88.28	85.00	0.70	41.50	90.83	0.04*
T/S Ratio	0.77	0.76	0.41	0.77	0.78	1.00
Gait speed (m/s)	1.00	1.01	0.62	0.73	0.93	0.18
Hand grip (Kg)	23.83	29.44	0.39	15.60	22.15	0.18

Abbreviations: IGF-1, Insulin-like Growth Factor-1; T/S ratio, telomeric DNA/beta-globin single copy gene ratio.

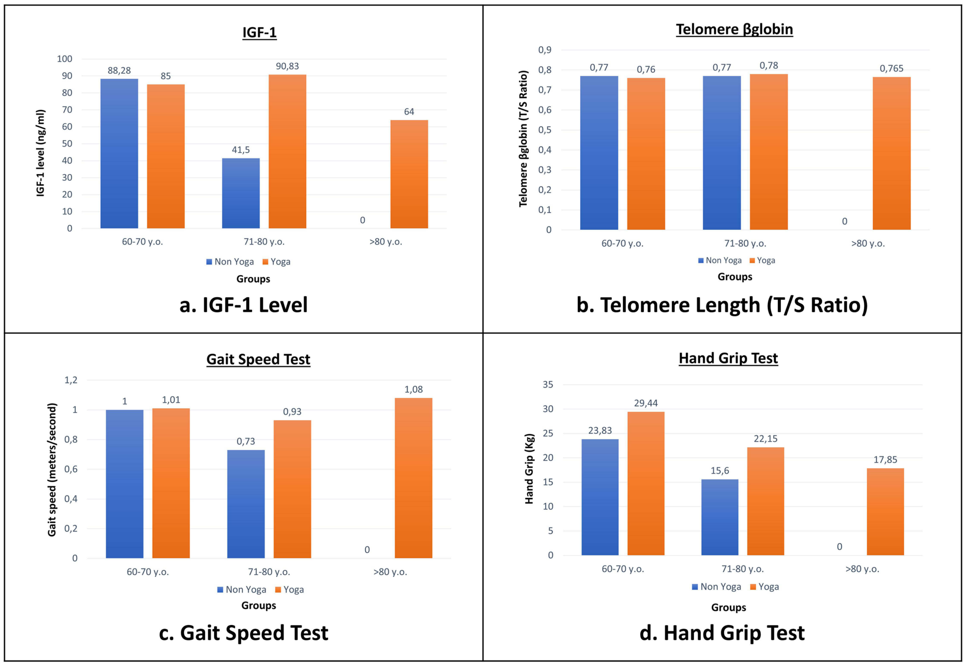

Figure 2 IGF-1 levels (**a**), Telomere length (T/S Ratio) (**b**), Gait speed test (**c**), and Hand grip test (**d**) in all subject groups.

The risk of sarcopenia was assessed using SARC-F questionnaire. Participants with a score of more than 4 are predictive of sarcopenia and poor outcomes.[5] In this research, no subject had a score of more than 2. Table 4 show that groups aged 60–70 years had more participants with no risk of sarcopenia (score = 0) compared to 1 or 2. In older age group of 71–80 years, only Yoga group had a higher number of participants with no risk than those with scores of 1 or 2. Interestingly, none of the Yoga participants aged more than 80 years had a risk of sarcopenia.

Discussion

Advancements in healthcare technology have led to longer life expectancy and an increase in older adult population. Recent concepts of wellness include more than physical factors.[33,34] In this study, the participants were accompanied to the examination site by a family member, even though there is increased capability of completing the questionnaire and performing all tests. There was no subject with age >80 years old in the non-yoga group. We assume that most older adults above 80 years old other than in yoga communities is less active physically or socially, or not quite independent to join this study.

IGF-1 is used as a marker of body wellness and is positively correlated with muscle health and endurance.[17,35] The levels decrease with age and men over 60 years old can have IGF-1 levels that are 5–20 times lower than the younger

Table 4 SARC-F Frequencies per Group

Group	Age (y.o)	SARC-F Score		
		0	1	2
Non-Yoga	60–70	14	3	1
	71–80	0	1	1
Yoga	60–70	8	3	0
	71–80	3	2	1
	>80	4	0	0

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individuals.[24,36] This decline contributes to the development of sarcopenia.[37] Serum IGF-1 levels below 80 ng/mL may be particularly harmful, specifically after the age of 75.[38]

In the Non-Yoga group, IGF-1 levels decreased from 82.5 ng/mL in ages 60–70 to 41.5 ng/mL in ages 71–80. For Yoga group, the levels decreased after the age of 80, reaching 64 ng/mL. A significant difference was observed between the groups in participants aged 70–80, as shown in Figure 2a. Yoga exercises focus on flexibility, endurance, and strength, including low-intensity resistance training using body weight, and balance.[39,40] Some research have shown an increase in IGF-1 levels following periods of resistance training in older adults.[41,42]

The results showed that long-term yoga practice is associated with higher IGF-1 levels. However, the levels decreased to below 80 ng/mL in participants over 80 years old. A total of two variants of IGF-1 are present in human skeletal muscle, namely IGF-IEa (systemic or liver-type isoform) and Mechano Growth Factor (MGF) (activity-sensitive local growth and repair factor). In very old adults, MGF response tends to attenuate, even though the same relative intensity of exercise is performed due to the selective atrophy of type II muscle fibers. Type II or fast-twitch fibers are replaced by type I or slow-twitch fibers, which are more efficient over long periods but less able to carry weight.[43,44] Therefore, the participants over 80 years old had lower IGF-1 levels.[25–29]

Regular physical activity is crucial for maintaining telomerase activity. Longer telomere are associated with slower muscle weakening in older adults.[27,28] Previous research showed the benefits of 90 days of yoga exercises in increasing telomerase activity, raising levels of β-endorphin, cortisol, and interleukin 6 (IL-6), as well as reducing levels of reactive oxidative species (ROS), and 8-hydroxy-2-deoxyguanosine.[15] For centuries, yoga has evolved into different styles and asanas/postures.[45] Older adults practiced yoga in low to moderate styles, specifically adapted for older individuals. There were no differences in telomere length between the groups. Therefore, low to medium impact of yoga style practiced was not sufficient to significantly increase telomerase activity. Aerobic endurance training and high-intensity interval training (HIIT) can also increase telomerase activity and length.[46,47] In this context, exercise needs to be performed at a sufficient rate of vascular shear stress to release nitric oxide (NO)[48] and modulate telomerase activity.[49] Another research suggests that interleukin-15 (IL-15), released from fast-twitch muscle fibers directly increases telomerase activity. Similar effect may not be produced since yoga for older adults is a slow-twitch fiber-dominated exercise.[50]

Many literatures showed a significant decrease of muscle performance (sarcopenia) at age >70 y.o.[51–53] This will be a critical point for the older adults related to the risk of frailty. Therefore, physical activity and adequate nutrition were indeed most needed after 70 y o. this study showed a significant level of IGF-1 in yoga group age >70 y.o, and higher gait speed and hand grip (p=0.18) compared to age 60–70 group (p=0.41 dan 0.62).

The risk of sarcopenia in older adults poses a threat to mobility and independence. Declines in skeletal muscle mass and function lead to weakness, imbalance, and FoF to reduce physical activity. Conversely, a lack of physical activity increases sarcopenia to create a vicious cycle. Sarcopenia is assessed using MRI and CT scans, but the methods are not used because of high cost and complexity.[54] In this research, simpler and validated methods are used, including SARC-F questionnaire,[5] gait speed test, and hand grip, following the guidelines of the European Working Group on Sarcopenia in Older People (EWGSOP).[54,55]

Participants in Yoga group had higher gait speed and hand grip test scores compared to Non-Yoga group but the difference was not statistically significant. According to interviews, the groups engaged in daily walks lasting between 30–60 minutes. None of the participants in this research had a gait speed lower than 0.6 m/s. A 12-week brisk walking program in research showed benefits in enhancing lower limb strength.[56] However, combining brisk walking with yoga exercises has been shown to improve muscle performance and reduce the risk of lower-extremity problems.[57]

Upper extremity strength is crucial for older adults to perform tasks such as reaching and pulling to maintain independence in daily activities.[58] Hand grip strength is a specific indicator of upper extremity strength.[59] Several research showed that hand grip strength could predict susceptibility to diseases, disability, and mortality.[50] Study by Krejci et al showed a significant positive improvements in static and dynamic balance, with significant body integration, including decreases in fat and increases in muscle mass with 4 weeks of daily simple yoga exercises.[60] A meta-analysis study by Ko et al supported the beneficial effects of yoga on physical outcomes among older adults, but its effects on improving gait and reducing stress among older adults were inconclusive depend on the frequency of yoga exercises.[61] This study involving older adults who perform yoga once a week for at least one year. We suggest that once a week frequency of yoga practice does not significantly improve gait speed and hand grip although support the independency of subjects.

A similar result was observed in SARC-F questionnaire, where Yoga group showed less risk of sarcopenia even after the age of 70 (Table 4). The participants came from two different yoga communities, showing that different styles of practice provided similar benefits. Regular practice enhances muscle balance, coordination, strength, and flexibility for maintaining autonomic body functions in older adults. These improvements reduce the risk of falls and increase self-confidence in performing daily activities.[16] Even though the research did not obtain significant differences in IGF-1 levels, Yoga group showed better performance compared to Non-Yoga. A randomized controlled trial with a larger sample size in a community setting is valuable in clarifying the benefits of yoga practice.

Conclusion

In conclusion, long-term yoga practice had positive effects on physical health in older adults, suggesting potential benefits in maintaining muscle strength and IGF-1 levels, as well as reducing the risk of sarcopenia. Although improvements in hand grip strength, gait speed, and SARC-F scores were observed, these differences were not statistically significant. Similarly, no significant differences were found in telomere length. Despite this, yoga practice demonstrates promise as an adjuvant option for sarcopenia prevention, particularly in individuals aged 70 years and above who are at greater risk of sarcopenia. These findings highlight the potential of yoga to enhance the quality of life and independence in older adults. Further studies with larger sample sizes and randomized controlled trials are needed to confirm these findings and explore the broader impact of yoga on aging populations.

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Disclosure

The authors report no conflicts of interest in this work.

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