

Reliability and Validity of an Isometric Knee Strength Measurement Device in Older Adults

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Abstract

Background: Degenerative loss of muscular strength, especially in the knee extensors and flexors, is a hallmark of aging that severely compromises functional independence and elevates fall risk among older adults. Precise quantification of muscular strength is therefore essential for effective diagnosis and intervention in geriatric rehabilitation. Although isokinetic dynamometry remains the reference standard for objective strength measurement, its cost, bulk, and operational complexity hinder its applicability in real-world clinical and community settings. Portable isometric testing devices offer a practical alternative, but rigorous validation studies are needed.

Objective: This study aimed to establish the test-retest reliability and concurrent validity of the Leg Strength Analyzer (IB-LS), a compact isometric dynamometry device developed by InBody Inc., against a gold-standard isokinetic dynamometer (CSMI Humac Norm) in a sample of community-dwelling older adults.

Methods: Twenty-one older adults (mean age: 65.10 ± 4.56 years; 11 men, 10 women) were recruited from senior community centers. Participants underwent standardized testing of bilateral knee extension and flexion strength using both the IB-LS and CSMI systems. The IB-LS protocol involved three maximal voluntary contractions per movement per limb, performed on the same day for test-retest assessment. A follow-up session was conducted 24 hours later for 17 participants, during which isokinetic strength testing at 60°/s was performed. Intraclass correlation coefficients (ICCs) were calculated to evaluate intra-device reliability and inter-device validity. Bland-Altman plots were used to assess agreement and bias across devices.

Results: The IB-LS demonstrated excellent test-retest reliability, with ICCs ranging from 0.856 to 0.987 across all testing conditions. Concurrent validity analyses revealed strong correlations between IB-LS and CSMI-derived measurements: ICCs ranged from 0.826 to 0.946 for isometric comparisons and from 0.775 to 0.881 for isokinetic comparisons. Bland-Altman analyses indicated acceptable limits of agreement, with no evidence of systematic measurement bias. The mean difference in torque between devices ranged from 13.2 to 93.5 Nm for isometric data and 31.0 to 56.0 Nm for isokinetic comparisons.

Conclusions: The findings substantiate the IB-LS as a reliable and valid instrument for assessing isometric knee strength in older adults. Its high agreement with standard dynamometry and user-friendly design position it as a feasible solution for strength assessment in clinical and community-based geriatric care. Clinical Trial: Not applicable.

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Original Manuscript

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Conclusions: The findings substantiate the IB-LS as a reliable and valid instrument for assessing isometric knee strength in older adults. Its high agreement with standard dynamometry and user-friendly design position it as a feasible solution for strength assessment in clinical and community-based geriatric care.

Trial Registration: Not applicable.

Keywords: agreement analysis; isometric knee strength; knee joint; older adults; validity

Introduction

The knee joint performs essential functions in daily activities, such as walking, climbing stairs, and sitting, and lower limb muscle strength plays a crucial role in physical mobility and balance maintenance [1]. However, age-related declines in muscle mass and strength impair knee joint function, making independent daily living more challenging and increasing the risk of falls and physical disabilities [2]. Muscle strength decreases by approximately 15% per decade after 50 years of age and by more than 30% after 70 years of age [3]. The World Health Organization (WHO) estimates that the global population aged 60 years and older will reach approximately 2.2 billion by 2050, highlighting the urgent need to manage health issues related to sarcopenia from a public health

perspective [4]. This decline in muscle strength is not merely a natural consequence of aging but is considered part of the pathological process of sarcopenia, which is strongly associated with deterioration of physical function and increased mortality [5].

Sarcopenia is characterized by quantitative and qualitative declines in skeletal muscle, leading to physical function deterioration, reduced gait speed, and impaired balance, making it difficult for one to maintain independent living [6]. In recognition of its clinical significance, the United States Centers for Disease Control and Prevention and the WHO have designated sarcopenia as a disease (code M62.84), while South Korea officially classified it as a disease (code M62.5) in the 2021 revision of the Korean Standard Classification of Diseases [7]. Individuals with sarcopenia have a four-fold increased risk of developing physical disabilities in daily life, along with a two-fold to threefold higher risk of balance and gait impairments [8]. Consequently, the necessity of objective lower limb strength assessments for the early diagnosis and prevention of sarcopenia has been internationally emphasized, underscoring the need for the development of effective evaluation methods [9].

Isometric and isokinetic strength assessments are the two primary methods for evaluating lower limb muscle strength, each serving distinct purposes in assessing physical function [10]. Isometric strength measurement evaluates maximal muscle strength without changes in muscle length, making it useful for assessing neuromuscular control and muscle function [11]. Conversely, isokinetic strength measurement evaluates muscle strength at a constant angular velocity, allowing for the analysis of the force-velocity relationship of muscles, which is widely used in sports injury assessments and rehabilitation [12]. Previous studies have reported a high correlation between isometric and isokinetic strength assessments, with findings suggesting that isometric strength testing alone can provide an objective evaluation of physical function [13].

One of the most widely used devices for lower limb strength assessment is the CSMI (CSMI Humac Norm, Computer Sports Medicine Inc., Stoughton, MA, USA), which is recognized as the gold standard for isokinetic strength evaluation [14]. However, the high cost, complex measurement procedures, and substantial spatial requirements of this device often limit its applicability in clinical and research settings [15]. As a more efficient and cost-effective alternative, the Leg Strength Analyzer (IB-LS, InBody Inc., Seoul, South Korea), recently developed by InBody, has gained attention. This device uses a load cell-based force measurement system designed to assess isometric strength during knee extension and flexion. However, a systematic validation is required to determine whether the reliability and validity of the IB-LS are equivalent to those of the existing gold standard device, CSMI.

Although previous studies have reported a high correlation between isometric and isokinetic strength measurements [16], the degree of correlation between the isometric strength values obtained from the IB-LS and the isometric and isokinetic strength values measured by the CSMI has not been sufficiently validated. There is a lack of research on the reliability of the IB-LS in comparison with conventional isometric reference devices and whether its isometric strength measurements can be associated with isokinetic strength evaluation.

This study aimed to determine whether the IB-LS device can serve as a reliable tool for assessing lower limb strength in older adults and to explore its applicability in clinical and research settings by analyzing its relationship with isokinetic strength measurements. Additionally, we sought to evaluate the utility of the IB-LS as a practical alternative to conventional isokinetic strength assessment devices and propose a more convenient and effective approach for assessing lower limb strength in older adults.

Methods

Recruitment

This study was conducted in 21 community-dwelling older adults residing in D Metropolitan City, South Korea. Participants were voluntarily recruited through local senior welfare centers and community organizations.

The study participants were adults aged 60–79 years who had no history of orthopedic or neurological injuries in the past 6 months and were able to perform daily activities independently. Conversely, individuals who had undergone lower limb surgery within the past 6 months, had musculoskeletal or neurological conditions that made lower limb strength assessment difficult, or withdrew from the study due to dizziness or discomfort during the experiment were excluded.

All study participants provided written informed consent after fully understanding the study's purpose and procedures and were allowed to voluntarily withdraw at any time during the study. The researchers closely monitored for any potential discomfort or adverse effects during the study period. The Institutional Review Board of K University approved this study (approval number: KYU-2023-11-046-003).

Procedures

This study was designed as a reliability and validity study to evaluate the reliability and validity of the IB-LS. The participants' sex, age, height, weight, dominant leg, and lower limb length were recorded. Muscle mass was measured using a body composition analyzer (InBody 570, InBody Inc.). The dominant leg was determined using a self-reported method based on the foot the participant primarily used. Lower limb length was measured as the distance from the anterior superior iliac spine to the medial malleolus.

Before knee strength assessment, participants performed a 5-minute warm-up on an ergometer bicycle (Wattbike Pro, Wattbike Ltd., Nottingham, UK) at an intensity of 50 watts. After completing the warm-up, they rested for 5 minutes before undergoing strength evaluation. Knee extension and flexion strength were assessed using the IB-LS and the CSMI dynamometer. The order of isometric strength measurements using the two devices was randomly assigned using a computer-generated random number generator.

After completing the isometric strength assessments using the IB-LS and CSMI devices, an additional isokinetic strength evaluation was conducted using the CSMI device with at least a 1-day interval to analyze the agreement between the isometric strength values measured by the IB-LS and the standardized isokinetic strength measurements. During the evaluation, participants performed knee extension and flexion strength assessments at a velocity of 60°/s, with each session consisting of five repetitions, and the peak value was recorded. Subsequently, the agreement between the isometric strength values measured by the IB-LS and the isokinetic strength values obtained from the CSMI device was analyzed to determine whether the IB-LS isometric strength assessment can serve as an equivalent alternative to isokinetic strength measurement.

All measurements were consistently conducted by a single experienced physical therapist using standardized methods to ensure accuracy across assessments.

Knee flexion and extension strength assessment device

The Leg Strength Analyzer is designed to assess lower limb strength and consists of a mechanical unit and a control unit. The mechanical unit includes a seat, leg fixation components, a leg strength measurement module, and handles, with an adjustable backrest for positioning. The leg strength measurement module has a total length of 470 mm and can be adjusted in nine stages according to leg length. When the participant is seated, the measurement module is positioned at the center of both legs, and a load cell is attached to measure the force exerted during knee flexion and extension.

The control unit consists of a power system and a 7-inch touchscreen display, providing real-time measurement values. The dimensions of the IB-LS mechanical unit are $610 \times 1,370 \times 1,065$ mm, with a total weight of 108 kg. The control unit measures $440 \times 440 \times 990$ mm and weighs 8.5 kg. The load cell has a measurement range of 5 to 150 kg, with precision up to one decimal place. The recorded measurement values include peak force and peak torque (Figure 1-a).

The CSMI dynamometer is designed for isokinetic and isometric strength assessments and is widely recognized as the standard equipment for lower limb strength measurement. The mechanical unit consists of a dedicated seat, leg fixation components, handles, stabilization straps, and a resistance module. During the assessment, the participant sat on the seat, gripped the handles with both hands, and secured their torso and pelvis using adjustable stabilization belts. The device measures muscle strength by providing consistent resistance at a preset angular velocity using a motor-based resistance system. This mechanism ensures that participants exert maximum force at the designated angular velocity, allowing for precise evaluation of isokinetic and isometric strength.

The control unit includes a touchscreen display and a power system, providing real-time measurement data. The movement speed can be adjusted within a range of $1\text{--}500^\circ/\text{s}$, and the isokinetic strength assessment was conducted at a velocity of $60^\circ/\text{s}$. The dimensions and weight of the CSMI dynamometer vary by model, and the model used here had a mechanical unit size of $910 \times 1,270 \times 1,220$ mm and a weight of 145 kg. The recorded measurement values include peak force and peak torque (Figure 1-b).

Statistical Analysis

To compare the general characteristics of the study participants, a chi-square test (χ^2 test) and an independent t-test were performed. To assess the test-retest reliability of the IB-LS device, each participant's knee flexion and extension strength were measured three times, and the peak force (kg) values were obtained. Then, intraclass correlation coefficient (ICC) analysis was conducted to evaluate reliability. The reliability levels were classified according to the criteria established by Rankin et al. (1998), where an ICC value of ≤ 0.25 was considered very low, 0.26–0.49 as low, 0.50–0.69 as moderate, 0.70–0.89 as high, and 0.90–1.00 as very high.

To evaluate the validity of isometric strength measurements between the IB-LS and CSMI devices, a paired t-test and ICC analysis were conducted. During this process, the force (kg) values measured by the IB-LS were converted into peak torque (Nm) values by multiplying them by the participant's lower leg length (m), defined as the distance from the center of the knee to the resistance application site. Next, the converted peak torque values were compared to the isometric strength measurements obtained from the CSMI device. Additionally, a paired t-test and ICC analysis were performed to assess the validity of the isometric peak torque values measured by the IB-LS in comparison with the isokinetic ($60^\circ/\text{s}$) peak torque values obtained from the CSMI device.

To assess the agreement between the measurements obtained from the two devices, a Bland–Altman analysis was performed. The mean difference, 95% confidence interval (CI), and limits of agreement (LoA) were calculated to examine the consistency of the measurements. According to the criteria established by Bland & Altman (1986), a mean difference closer to zero and a narrower LoA range would indicate a higher level of agreement between the two devices, suggesting minimal measurement bias and high reproducibility. The mean difference and LoA range between IB-LS and CSMI measurements were numerically compared, and the Bland–Altman analysis results for isometric and isokinetic strength assessments were analyzed separately to evaluate the level of agreement between the two devices.

Statistical analyses were performed using SPSS (version 22.0, IBM Corp., Armonk, NY, USA) and MedCalc (MedCalc Software Ltd., Ostend, Belgium). The significance level for all analyses was set at 0.05.

Results

A total of 21 older adults (11 males and 10 females) participated in this study, with a mean age of 65.10 ± 4.56 years. The isokinetic strength assessment was conducted at least 1 day after the initial evaluation, with 17 participants (7 males and 10 females) completing the second measurement. Four participants who did not attend the follow-up assessment were excluded from the analysis (Table 1). No adverse reactions were observed in any participants during the experimental procedures.

Table 1. Participant's characteristics (n=21).^{a-b}

Variable	Mean $\pm$ SD	t (P value)
Sex (male/female)	11 / 10	0.213 (0.833)
Age (years)	65.10 ± 4.56	65.422 (<0.001)
Height (cm)	161.62 ± 7.59	97.525 (<0.001)
Weight (kg)	65.91 ± 10.92	27.647 (<0.001)
Dominant side (left/right)	0 / 21	
Left leg length (cm)	36.38 ± 2.72	61.193 (<0.001)
Right leg length (cm)	36.31 ± 2.64	62.949 (<0.001)
BMI	25.24 ± 3.46	34.241 (<0.001)
Muscle mass (kg)	25.95 ± 6.36	19.142 (<0.001)
Left grip strength (kg)	32.86 ± 11.42	13.069 (<0.001)
Right grip strength (kg)	33.62 ± 10.21	15.149 (<0.001)

^a Values are presented as mean $\pm$ standard deviation. P values are based on one-sample t-tests.

^b BMI: body mass index; SD: standard deviation.

The test-retest reliability assessment of the IB-LS device demonstrated high reliability across all parameters (ICC = 0.856–0.987) (Table 2). The ICC value for left knee flexion was 0.982, whereas that for right knee extension was 0.856 (Figure 2). A comparison of the isometric strength measurements between the IB-LS and CSMI devices showed an ICC range of 0.826–0.946 across all parameters (Table 3). The ICC value for left knee flexion was 0.946, whereas that for left knee extension was 0.826. The ICC values for right knee flexion and extension were 0.946 and 0.883, respectively. The mean differences in isometric strength values between the two devices were statistically significant (all, $p < 0.05$), with mean differences of 12.04 Nm for left knee flexion and 7.38 Nm for right knee flexion. A comparison between the isometric strength values measured by the IB-LS and the isokinetic (60°/s) strength values obtained from the CSMI device showed an ICC range of 0.775–0.881 (Table 4). The ICC value for left knee flexion was 0.881, whereas that for left knee extension was 0.847 (Figure 3). The ICC values for right knee flexion and extension were 0.807 and 0.775, respectively. The mean differences between IB-LS and CSMI isokinetic (60°/s) strength measurements were 16.39 Nm for left knee flexion and 43.9 Nm for right knee extension.

Table 2. Intraclass correlation coefficients for knee joint isometric muscle peak force (N=21).^a

Side	Movement	IB-LS peak force (kg)			ICC
		1st trial	2nd trial	3rd trial	
Left	Flexion	18.92 ± 6.79	18.16 ± 7.38	18.25 ± 6.95	0.982
	Extension	30.02 ± 9.54	30.50 ± 13.07	31.68 ± 12.63	0.975
Right	Flexion	20.36 ± 7.65	19.62 ± 7.69	19.51 ± 7.25	0.987
	Extension	29.57 ± 10.85	33.15 ± 11.00	32.97 ± 11.11	0.856

^a IB-LS: Leg Strength Analyzer; ICC: intraclass correlation coefficient.

Table 3. Validity comparison of knee isometric peak torque between IB-LS and CSMI devices (N=21).^a

Side	Movement	IB-LS isometric peak torque (Nm)	CSMI isometric peak torque (Nm)	t (P value)	ICC
Left	Flexion	76.04 ± 31.97	64.00 ± 24.86	4.244 (<0.001)	0.946
	Extension	118.60 ± 46.00	101.48 ± 42.18	2.310 (0.032)	0.826
Right	Flexion	71.05 ± 28.10	63.67 ± 24.16	2.846 (0.010)	0.946
	Extension	125.08 ± 45.81	106.48 ± 41.49	3.010 (0.007)	0.883

^a IB-LS: Leg Strength Analyzer; CSMI: Computer Sports Medicine Inc.; ICC: intraclass correlation coefficient; Nm: Newton-meter.

Table 4. Validity of knee flexion and extension isometric peak torque of IB-LS and isokinetic 60°/s of CSMI devices. (n=17).^a

Side	Movement	IB-LS isometric peak torque (Nm)	CSMI isokinetic 60°/s peak torque (Nm)	t (P value)	ICC
Left	Flexion	69.78 ± 30.63	53.39 ± 25.92	3.655 (0.002)	0.881
	Extension	108.09 ± 40.07	86.32 ± 38.37	3.140 (0.006)	0.847
Right	Flexion	65.98 ± 28.29	44.43 ± 23.39	4.254 (0.001)	0.807
	Extension	117.98 ± 45.35	74.08 ± 37.76	5.062 (<0.001)	0.775

^a IB-LS: Leg Strength Analyzer; CSMI: Computer Sports Medicine Inc.; ICC: intraclass correlation coefficient; Nm: Newton-meter.

The Bland–Altman analysis revealed that the mean difference in isometric strength measurements between the IB-LS and CSMI devices ranged from 13.2–93.5 Nm (Table 5). The mean difference between the IB-LS isometric peak torque values and the CSMI isokinetic (60°/s) peak torque values was 31.0–56.0 Nm. For left knee flexion (isometric), the mean difference was 13.2 Nm (LoA: -55.8–82.2 Nm), whereas for left knee extension (isometric), the mean difference was 74.7 Nm (LoA: -6.2–155.6 Nm). In isokinetic assessments, the mean difference for left knee flexion was 38.2 Nm (LoA: -16.24–92.7 Nm), and for left knee extension, it was 48.4 Nm (LoA: -11.71–108.4 Nm). For right knee flexion (isometric), the mean difference was 28.1 Nm (LoA: -34.5–90.8 Nm), whereas for right knee extension (isometric), it was 93.5 Nm (LoA: -5.6 to 192.5 Nm). In isokinetic assessments, the mean difference for right knee flexion was 31.0 Nm (LoA: -28.46–90.6 Nm), and for right knee extension, it was 56.0 Nm (LoA: -26.91–138.9 Nm). The IB-LS device demonstrated high test-retest reliability across all parameters (ICC = 0.856–0.987), while the isometric strength measurements compared with the CSMI device showed an ICC range of 0.826–0.946. The ICC values between IB-LS and CSMI isokinetic (60°/s) measurements ranged from 0.775–0.881. The Bland–Altman analysis indicated that the mean difference in strength measurements between the two devices ranged from 13.2–93.5 Nm.

Table 5. Validity of knee flexion and extension isometric peak torque of IB-LS and isokinetic 60°/s of CSMI devices. (n=17).^a

Type	Side	Movement	Mean Diff (Nm)	95% CI	LoA	p
isometric	Left	Flexion	13.2	-25.49 to 56.45	-55.8 to 82.2	<0.001

peak torque (Nm)	Right	Extension	74.7	-6.18 to 155.66	-6.2 to 155.6	<0.001
		Flexion	28.1	-34.52 to 75.17	-34.5 to 90.8	<0.001
		Extension	93.5	-30.27 to 167.78	-5.6 to 192.5	<0.001
isokinetic peak torque (Nm)	Left	Flexion	38.2	29.11 to 47.38	-16.24 to 92.7	<0.001
		Extension	48.4	38.28 to 58.43	-11.71 to 108.4	<0.001
	Right	Flexion	31.0	21.07 to 41.03	-28.46 to 90.6	<0.001
		Extension	56.0	42.09 to 69.91	-26.91 to 138.9	<0.001

^a Mean Diff: Mean Difference; IB-LS: Leg Strength Analyzer; CSMI: Computer Sports Medicine Inc.; LoA: limits of agreement; Nm: Newton-meter.

Discussion

The test-retest reliability of the IB-LS device was confirmed with an ICC range of 0.856–0.987, indicating that the device provides consistent results when repeated measurements are conducted in the same participants. Additionally, high ICC values were observed for knee flexion and extension, supporting the use of IB-LS as a reliable assessment tool. This finding aligns with those of previous studies, which emphasize that knee strength measurements must maintain reliability across repeated assessments and that isometric strength measurements should exhibit minimal variation between trials. Iso-metric strength assessment has a lower measurement error and higher reproducibility compared with dynamic strength assessment, and this study's results further support this notion.

The peak strength of knee extension is measured at approximately 60°, whereas the peak strength of knee flexion is highest at approximately 30° [20]. Therefore, isokinetic strength assessment at 60°/s is commonly used to evaluate muscle strength, whereas iso-kinetic assessment at 180°/s is used to assess muscular endurance [21]. In the present study, participants' measurement posture was standardized such that full knee extension was defined as 0°, with knee flexion measured at 30° and knee extension at 60°. During the measurement, a variation of approximately 10° in knee flexion and extension could occur. Assessing muscle strength is essential for minimizing potential risks and evaluating an individual's ability to return to daily activities after an injury. This is particularly important for determining the effectiveness of rehabilitation programs and quantitatively monitoring a patient's recovery progress [22]. Therefore, accurate strength measurement plays a crucial role in supporting functional recovery and establishing personalized rehabilitation plans.

The validity of isometric strength measurements between the IB-LS and CSMI devices was confirmed with an ICC range of 0.799–0.946, indicating a high level of agreement between the two devices. This suggests that the isometric strength values measured by the IB-LS closely align with those obtained from the standardized strength assessment device, CSMI, supporting its reliability as an assessment tool in clinical and research settings. The ICC between isometric strength values measured by the IB-LS and isokinetic (60°/s) strength values obtained from the CSMI device ranged from 0.775–0.869. This result indicates that isometric strength has a substantial relationship with isokinetic strength and may have potential applications in supplementing isokinetic assessments or predicting muscle strength. Isometric strength measurement offers practical advantages, as it can be performed with a simpler measurement process and lower cost compared with isokinetic measurement. Therefore, it may serve as a viable alternative in environments where iso-kinetic strength assessment is challenging to implement.

The Bland–Altman analysis showed that the mean difference in isometric strength measurements between the IB-LS and CSMI devices was 13.2 ± 3.5 Nm, with a LoA range of -55.8 to 192.5 Nm. This indicates that, overall, the measurements from both devices are similar, although some individual measurements may show discrepancies. Additional evaluation may be necessary to determine whether any measurement bias is present. The mean difference between the IB-LS

isometric peak torque values and the CSMI isokinetic (60°/s) peak torque values was 31.0 ± 6.0 Nm, with a LoA range of -28.5 to 138.9 Nm. This suggests that isometric strength may not only serve as a measure of static strength but also have a meaningful relationship with isokinetic strength.

Previous studies in patients who underwent total knee arthroplasty reported that isometric torque was 128 ± 44 Nm, whereas isokinetic peak torque was 94 ± 37 Nm, with significant correlations observed between the two strength measurements and Western Ontario and McMaster Universities Osteoarthritis Index function ($r = 0.618$ and 0.663 , re-spectively) as well as walking speed ($r = 0.641$ – 0.710) [23,24]. Similarly, in this study, a strong correlation was found between the isometric peak torque measured using the IB-LS and the isokinetic peak torque obtained from the CSMI device. This finding suggests that both strength assessment methods can serve as important indicators in evaluating physical function.

Muscle strength assessment using the IB-LS device is a fast, convenient, and reliable evaluation method, making it suitable for clinical applications. Compared with the CSMI device, the IB-LS offers advantages such as simpler initial calibration, fewer spatial constraints, and greater portability, allowing for its use in various settings. Additionally, knee isometric strength has shown significant correlations with walking speed and the Timed Up and Go test, supporting its role as an essential tool for lower limb function assessment [25,26].

The present study has several limitations. First, the small sample size limits the generalizability of the findings; thus, future studies should include a more diverse population considering different age groups and physical conditions. Second, the influence of participants' exercise experience on strength measurement results was not controlled, necessitating further research on this factor. Third, follow-up studies are needed to determine whether the IB-LS device can be used for long-term monitoring of muscle strength changes. Lastly, this study assessed isokinetic strength at a single velocity (60°/s), so additional analyses at different speeds may be required. Additionally, further research is needed to evaluate the practical applicability of the IB-LS device in various clinical settings.

Conclusions

This study confirmed that the IB-LS device demonstrates high reliability and validity in measuring knee isometric strength and exhibits strong agreement with isokinetic strength assessment devices. Therefore, the IB-LS device can serve as a reliable assessment tool in clinical and research settings, complementing conventional isokinetic strength evaluation devices. Additionally, it has the potential to assess not only lower limb strength but also overall physical function, making it a promising alternative for isometric strength assessment in various clinical and research environments.

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Conflicts of Interest

The authors declare no conflicts of interest.

Abbreviations

CSMI: Computer Sports Medicine Inc.

ICC: Intraclass correlation coefficient

IB-LS: Leg Strength Analyzer

LoA: Limits of Agreement

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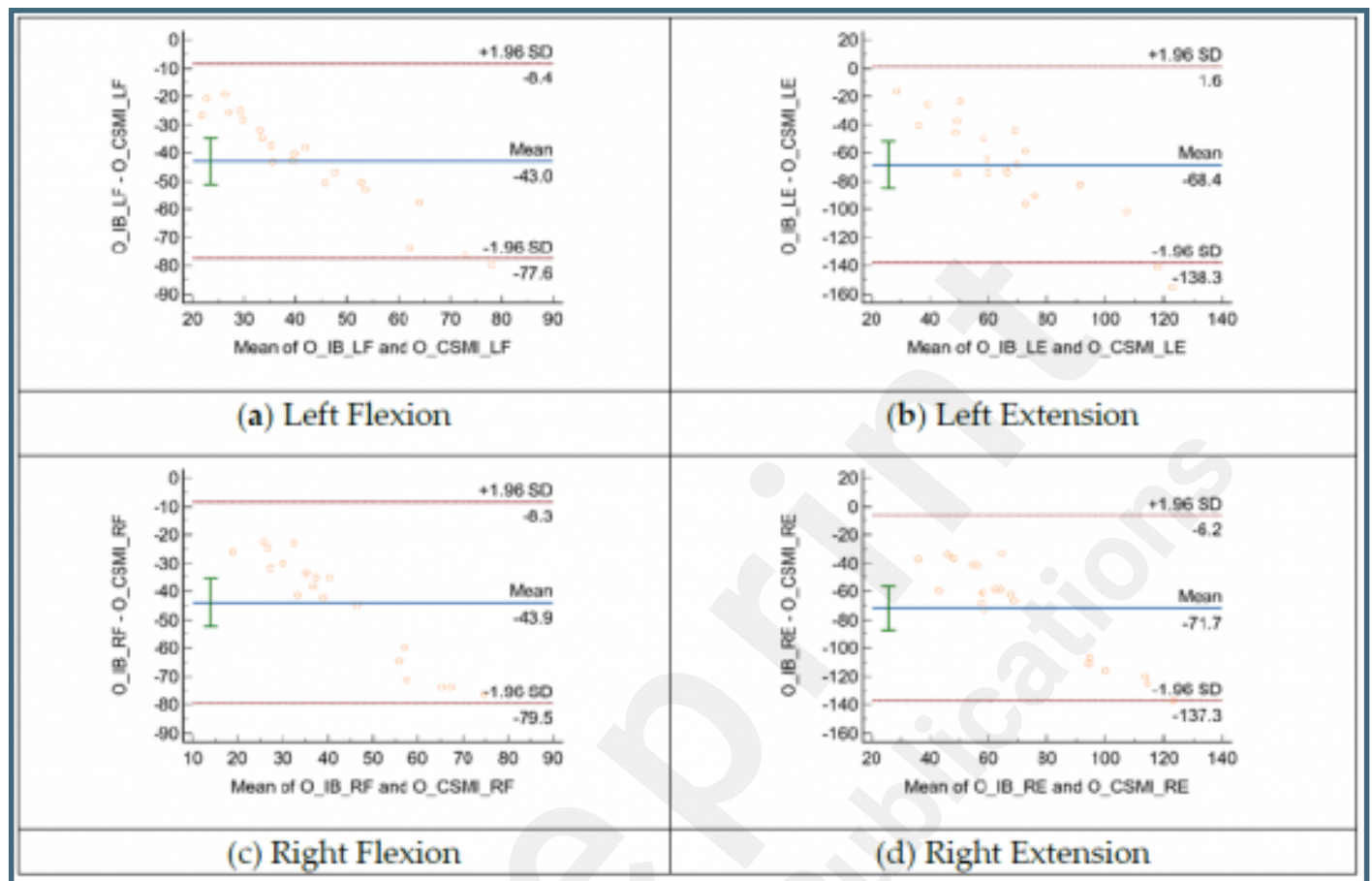
Supplementary Files

Figures

The device of this experimental study: (a) Leg Strength Analyzer; (b) CSMI dynamometer.



A graph comparing the mean difference in knee flexion/extension isometric peak torque between IB-LS and CSMI.



A graph comparing the mean difference between the elderly group knee flexion/extension iso-metric/isometric 60°/s peak torque between IB-LS and CSMI.

