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Between-session reliability and measurement error of a commercial surface electromyography system across isometric and dynamic exercise conditions in resistance-trained adults

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Article

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Abstract

Introduction:

Commercial surface electromyography (sEMG) systems are increasingly used to assess muscle activity, but their between-session reliability and measurement error require evaluation.

Aim

To evaluate the within-examiner, between-session reliability and measurement error of the MyoAct sEMG system during selected isometric and dynamic exercise conditions in resistance-trained adults.

Methods

Fourteen healthy adults (10 males) completed two test sessions seven days apart. sEMG was recorded from the vastus medialis obliquus (VMO) during knee extension and infraspinatus (IS) during shoulder external rotation. Participants performed maximal voluntary isometric contractions and three dynamic sets at 50%, 70% and 85% of estimated one-repetition maximum. Reliability was assessed using intraclass correlation coefficients (ICC), standard errors of measurement (SEM) and Bland–Altman analysis.

Results

Reliability varied by muscle and exercise condition. VMO reliability was good during maximal isometric contractions and dynamic contractions at 50% and 70% of one-repetition maximum, and moderate at 85%; all IS measurements showed poor reliability. SEM ranged from 14.2% to 16.2% of the grand mean for VMO and from 18.3% to 24.0% for IS. Limits of agreement were wide for both muscle–exercise conditions. VMO retest values were significantly higher at 50% and 70%; no other between-session differences were detected.

Conclusion

MyoAct reliability was muscle- and exercise-specific. Small between-session changes should be interpreted cautiously, particularly for IS and conditions with substantial measurement error. Findings are limited to within-examiner repeated assessments in resistance-trained adults and should not be generalised to patients, other examiners or other sEMG systems.

INTRODUCTION

Surface electromyography (sEMG) uses non-invasive electrodes to detect electrical potentials generated by muscle fibre action potentials, thereby providing important information about the timing and amplitude of skeletal muscle excitation [1]. Commercial sEMG systems incorporating wireless sensors and software applications have increased the accessibility of recording muscle activity during exercise [2]. However, measurements may be affected by differences in hardware, electrode configuration, signal acquisition, and processing. Device- and condition-specific estimates of reliability and measurement error are therefore required before changes in sEMG amplitude across sessions can be interpreted with confidence [3].

Surface EMG measurements are influenced by multiple sources of biological and technical variation, including electrode placement, movement artefacts, crosstalk from adjacent muscles, electromagnetic interference and differences in signal acquisition [4]. Despite these challenges, systematic reviews have reported moderate to excellent reliability of sEMG measurements in several clinical and research applications [5, 6]. However, reliability is not an inherent property of a measurement instrument. Rather, it depends on the population and conditions under which measurements are obtained [7]. Consequently, reliability estimates obtained using traditional laboratory-based sEMG systems cannot be assumed to apply to newer commercially available systems intended for routine clinical use. The measurement properties of such commercially available sEMG systems must therefore be established under standardized and clinically relevant conditions.

MyoAct is a commercially available sEMG system that provides processed estimates of muscle excitation during exercise. We identified no published studies evaluating the between-session reliability and measurement error of Myoact sEMG measurements. Consequently, it remains unclear whether differences between repeated measurements reflect changes in muscle excitation or variation arising from the measurement procedure. Establishing these measurement properties under defined testing conditions is necessary before repeated measurements obtained using the same procedures can be interpreted with confidence.Frp

This exploratory study aimed to estimate the within-examiner, between-session reliability and measurement error of MyoAct sEMG measurements obtained from the vastus medialis obliquus during knee extension and the infraspinatus during shoulder external rotation under standardised isometric and dynamic testing conditions.

METHODS

Study design

This test–retest reliability study was designed and reported in accordance with the Guidelines for Reporting Reliability and Agreement Studies [8]. The study evaluated within-examiner, between-session reliability. Each participant was assessed by the same examiner at both sessions. The study comprised two test sessions separated by seven days to assess the between-session reliability and measurement

error of Myoact sEMG measurements. Surface EMG was recorded from the vastus medialis obliquus (VMO) during knee extension and from the infraspinatus (IS) during shoulder external rotation. For each muscle, recordings were obtained during two conditions: first, an isometric maximal voluntary contraction (MVC), and second, three sets of dynamic contractions performed at different intensities. To minimize extraneous sources of measurement variability, all procedures were standardized, including participant instructions, electrode placement, warm-up, exercise execution, and data collection. All testing was conducted at VIA University College in Aarhus, Denmark.

Subjects

Eligibility criteria

Participants were eligible if they were aged 18–40 years, reported being in good health, and had prior resistance training experience, defined as having previously engaged in regular resistance training (i.e. at least twice per week) for a minimum of three consecutive months. Exclusion criteria were previous surgery to the dominant shoulder or knee, injury to either region within the previous year, neurological or musculoskeletal conditions affecting neuromuscular function, medication affecting the nervous system, skin conditions at the electrode placement site, pregnancy, and physical inactivity. Physical inactivity was defined as engaging in less than 2 hours of structured exercise per week during the preceding month.

Recruitment

Participants were recruited between March 1st and April 30th, 2026, through advertisements on social media; printed posters were also displayed at two local educational institutions (VIA University College, Aarhus N, and Aarhus University). Interested volunteers registered through an online screening questionnaire. A total of 17 people registered and were screened; 16 met the eligibility criteria and 14 completed the test protocol. One participant withdrew prior to testing, and one participant was excluded because the test protocol was not completed as standardised (Fig. 1).

Test protocol

Preparations

Participants were randomly assigned to one of two examiners (SF, NB) using a computer-generated sequence (Random Group Generator, The University of Edinburgh). Participants were randomly allocated to one of two examiners, and each participant was assessed by the same examiner at both sessions to minimize examiner-related variability. Furthermore, participants were blinded to the measurement results until completion of the final recording on the final test day. Before each test session, participants were instructed to refrain from exercise for 24 hours. An overview of the assessment protocol is presented in

Fig. 2. Anthropometric measurements were collected at the first session. Height was measured using a stadiometer, and body mass and body fat percentage were assessed using a bioelectrical impedance analyzer (Tanita, Tanita Corporation, Tokyo, Japan).

Testing

Wireless bipolar sEMG sensors (PicoBlue, 4-channel; Cometa Systems, Italy) were placed according to the Myoact application guidelines, which are based on the SENIAM recommendations for electrode placement [9]. Before sensor placement, the skin was shaved when necessary, cleaned with alcohol and gently abraded with fine sandpaper.

All participants completed a standardized warm-up consisting of 5 minutes on a cross trainer at a fixed workload (100W for women and 125W for men). For each strength exercise, a familiarisation set was performed, followed by up to three 1RM attempts. The 1RM was reassessed at each session, and the dynamic loads were calculated from the session-specific 1RM.

Surface EMG was recorded from the VMO during isolated knee extension (LE) and from the IS during isolated shoulder external rotation (SER). For each exercise, a 5-s isometric MVC was performed prior to three dynamic sets at 50%, 70%, and 85% of 1RM. A 90-s rest interval was provided between all sets, including warm-up and 1RM attempts. Dynamic repetitions were performed at a controlled tempo of 1.5 seconds for the concentric and eccentric phases, paced by a metronome. The same exercise order and testing procedure were repeated at the second testing session. At the second session, sensor placement was reproduced using the same anatomical landmarks and placement instructions as at the first session.

LE was performed on a leg extension machine (Technogym, Technogym S.p.A., Cesena, Italy), with the ankle positioned neutrally and the knee joint aligned with the machine's axis of rotation (Fig. 3). The starting knee angle was measured using a goniometer. The isometric MVC was performed at 70° of knee flexion with the ankle pad fixed, whereas dynamic contractions were performed from 100° of knee flexion to full extension (≤ 0° knee flexion).

SER was performed using a cable tower (Technogym, Technogym S.p.A., Cesena, Italy) with cable height adjusted to the participant's hand position at 90° elbow flexion (Fig. 3). Participants stood sideways to the cable tower, with the forearm positioned in front of the abdomen in the starting position. The elbow was maintained against the trunk using a towel positioned between the elbow and the body, while foot placement was standardised using tape markers. The movement consisted of shoulder external rotation of the participant's comfortable range, followed by a return to the starting position, while avoiding scapular retraction and trunk rotation.

Data collection

The Myoact software acquired sEMG signals at a sampling frequency of 1000 Hz. The MyoAct software processed the raw sEMG signals (converted to microvolts (μV)) using root mean square values averaged over consecutive 50-ms epochs. For each recording, the software automatically identified the highest 30% of 50-ms RMS epochs and calculated their mean absolute amplitude, which was used as the outcome measure. For each recording, outcome measures were extracted separately for each muscle and subsequently used for reliability analysis. The manufacturer was contacted for additional technical information; however, complete specifications regarding proprietary filtering and onboard signal processing were not available to the investigators.

Sample size

No a priori sample-size calculation based on a target ICC or desired confidence-interval width was performed. The sample size was determined by feasibility, and the study should therefore be considered exploratory.

Statistical analysis

Statistical analyses were performed using JASP version 0.19.5, while Microsoft Excel version 16.108.1 was used for data organisation and Bland–Altman plots. Relative test–retest reliability was evaluated using a two-way mixed-effects, single-measure intraclass correlation coefficient for absolute agreement, ICC(3,1), with 95% confidence intervals. ICC values were interpreted according to Koo and Li [10] using the lower bound of the 95% confidence interval: <0.50, poor; 0.50–0.75, moderate; 0.75–0.90, good; and > 0.90, excellent. Absolute measurement error was estimated using the standard error of measurement, calculated as SEM = SDpooled × √(1 − ICC) [11]. Agreement between sessions was evaluated using Bland–Altman analysis, including the mean difference calculated as test minus retest and the 95% limits of agreement. The distribution of test-retest differences was assessed using the Shapiro–Wilk test. Between-session differences were evaluated using paired t-tests when the differences were approximately normally distributed and Wilcoxon signed-rank tests otherwise. Statistical significance was set at $p < 0.05$.

Ethical considerations

All participants received written and verbal study information and provided written informed consent in accordance with the Declaration of Helsinki [12]. According to institutional assessment, formal ethical approval was not required for this reliability study in healthy volunteers. Data were pseudonymised and handled in accordance with GDPR and Danish data protection legislation [13, 14].

RESULTS

Table 1
Participant demographics

Descriptive	Mean (SD)	Min	Max
Age (years)	24.5 (2.6)	18	30
Height (cm)	179.8 (9.0)	162	192.5
Weight (kg)	78.2 (12.0)	61.1	98.7
Body mass index (kg/m^2)	24.1 (2.4)	21.4	30.5
Body fat percentage (%)	18.4 (5.3)	10.7	27.6
Gender	Female n = 4 (28.6%), Male n = 10 (71.4%)		
All numeric variables are normally distributed with a P-value of Shapiro Wilks Test < 0.05; SD = standard deviation; Min = minimum; Max = maximum; n = numbers; m = meters; cm = centimeters; kg = kilograms			

Table 1 presents the baseline characteristics of the study participants. A total of 14 participants were included, comprising 10 men (71.4%) and 4 women (28.6%). The participants had a mean age of 24.5 years (SD 2.6), a mean body mass index of 24.1 kg/m² (SD 2.4), and a mean body fat percentage of 18.4% (SD 5.3).

Table 2
Myoact sEMG test and retest measurements (n = 14)

Outcome measure		Test	Retest	Comparison
I		µV, mean (SD)	µV, mean (SD)	P-value
VMO (LE)	MVC	802.8 (377.0)	889.9 (424.4)	0.088
	50% 1RM	508.0 (234.9)	572.9 (218.5)	0.046 †
	70% 1RM	598.4 (252.9)	689.4 (249.2)	0.021 †
	85% 1RM	708.2 (308.7)	771.2 (294.4)	0.192
IS (SER)	MVC	596.1 (124.9)	555.3 (180.3) *504.5 (461–615)	0.091
	50% 1RM	459.8 (126.84)	480.4 (203.3) *409.5 (334–538)	0.855
	70% 1RM	544.5 (147.4)	513.2 (195.5) *453.5 (397–545)	0.358
	85% 1RM	544.2 (126.0)	520.6 (187.45)	0.546

* = data is not normally distributed (p-value of Shapiro Wilks Test is < 0.05). *median and quartiles 1–3 are shown.

† = paired sample test of “test” and “retest” data indicates systematic bias at α = 0.05 (p-value < 0.05).

VMO = vastus medialis obliquus, IS = infraspinatus, LE = leg extension, SER = shoulder external rotation, MVC = maximum voluntary contraction (5 sec. isometric), 50% / 70% / 85% 1RM = percentages of 1 repetition maximum (5 dynamic reps), sEMG = surface electromyography, µV = microvolts, SD = standard deviation.

Table 2 presents test-retest measurements (µV). Statistically significant differences between test and retest emerged for the VMO measurements at 50% and 70% of 1RM, whereas no significant differences were observed for the remaining VMO and all IS measurements. **Test-retest reliability results**

Table 3
Reliability results of Myoact sEMG test-retest measurements (n = 14)

Outcome measure		**ICC**	**95% CI**	**Interp.**	**MD**	**LoA [lower; upper]**	**SEM, µV**
I		**I**	**[lower; upper]**	**(Koo&Li)**	**(%GM)**	**[LoA in %GM]**	**(%GM)**
VMO (LE)	MVC	0.903	[0.828; 0.949]	≥Good	-87.1 *(-10.3%)*	[-433.5; 259.2] *[-51.2%; 30.6%]*	123 *(14.6%)*
	50% 1RM	0.883	[0.794; 0.935]	≥Good	-64.9 † *(-12.0%)*	[-280.0; 150.2] *[-51.9%; 27.8%]*	77 *(14.2%)*
	70% 1RM	0.867	[0.767; 0.926]	≥Good	-91.0*† *(-14.1%)*	[-344.9; 162.9] *[-53.6%; 25.3%]*	91 *(14.2%)*
	85% 1RM	0.839	[0.722; 0.909]	≥Moderate	-63.0 *(-8.5%)*	[-398.5; 272.5] *[-53.9%; 36.8%]*	119 *(16.2%)*
IS (SER)	MVC	0.511	[0.252; 0.702]	≥Poor	40.8* *(7.1%)*	[-260.0; 341.6] *[-45.1%; 59.3%]*	107 *(18.7%)*
	50% 1RM	0.542	[0.292; 0.723]	≥Poor	-20.6 *(-4.4%)*	[-345.6; 304.3] *[-73.5%; 64.7%]*	113 *(24.0%)*
	70% 1RM	0.648	[0.435; 0.793]	≥Poor	31.3 *(5.9%)*	[-256.3; 318.9] *[-48.5%; 60.3%]*	101 *(19.1%)*
	85% 1RM	0.615	[0.389; 0.771]	≥Poor	23.6 *(4.4%)*	[-256.0; 303.3] *[-48.1%; 57.0%]*	98 *(18.3%)*

* = test minus retest differences are not normally distributed (p-value of Shapiro Wilks Test < 0.05).

† = Statistically significant between-session paired samples difference at $p < 0.05$.

VMO = vastus medialis obliquus, IS = infraspinatus, LE = leg extension, SER = shoulder external rotation, MVC = maximum voluntary contraction (5 sec. isometric), 50% / 70% / 85% RM = percentages of 1 repetition maximum (5 dynamic reps), ICC = intraclass correlation coefficient (two-way mixed-effects model), CI = confidence interval, interp. = interpretation, MD = average of differences, %GM = % of grand mean, SEM = standard error of measurement, LOA = limits of agreement, μV = microvolts.

Condition-specific relative reliability

Based on the prespecified interpretation of the lower bounds of the ICC 95% confidence intervals, reliability was classified as good for VMO measurements during MVC and dynamic contractions at 50% and 70% of 1RM, and moderate at 85% of 1RM. Reliability was classified as poor for all IS measurements (Table 3)

Measurement uncertainty

SEM ranged from 14.2–16.2% of the grand mean (GM) across VMO measurements and from 18.3–24.0% of the GM across IS measurements (Table 3)

Bland Altman analysis

Vastus medialis obliquus measurements

Figure 4 shows a Bland-Altman plot for each condition of the VMO outcome measures. The mean differences ranged from − 91.0 to − 63.0 μV across conditions, corresponding to − 8.5% to − 14.1% of the grand mean. Retest values were numerically higher across all VMO conditions, with statistically significant between-session differences observed at 50% and 70% of 1RM. Visual inspection provided no clear indication of proportional bias, as the differences appeared to be distributed without a systematic pattern across the range of measured values. The limits of agreement were wide across all conditions, ranging from − 433.5 to 259.2 μV for MVC, − 280.0 to 150.2 μV at 50% of 1RM, − 344.9 to 162.9 μV at 70% of 1RM, and − 398.5 to 272.5 μV at 85% of 1RM.

Infraspinatus measurements

Figure 5 shows the Bland–Altman plots for the IS measurements. The mean differences ranged from − 20.6 to 40.8 μV across conditions, corresponding to − 4.4% to 7.1% of the grand mean. The direction of the between-session differences varied across conditions, and no statistically significant between-session differences were observed. Visual inspection provided no clear indication of proportional bias, as the differences appeared to be distributed without a systematic pattern across the range of measured values. The limits of agreement were wide across all conditions, ranging from − 260.0 to 341.6 μV for MVC, − 345.6 to 304.3 μV at 50% of 1RM, − 256.3 to 318.9 μV at 70% of 1RM, and − 256.0 to 303.3 μV at 85% of 1RM.

DISCUSSION

The principal finding was that within-examiner, between-session reliability varied across muscle–exercise conditions. Reliability was good for VMO measurements during MVC and dynamic contractions at 50% and 70% of 1RM, moderate at 85% of 1RM, and poor for all IS measurements. Measurement error and wide limits of agreement were observed for both muscle–exercise conditions, indicating limited ability to distinguish small individual changes between sessions. These findings demonstrate that reliability observed for one muscle or contraction condition should not be generalised to the system as a whole.

Previous studies have reported relatively high ICC point estimates for VMO sEMG measurements [15–17], although differences in study design limit direct comparison with the present findings. For example, Fauth et al. [15] reported ICC values above 0.80 during isometric and ballistic tasks in healthy adults; however, their analysis concerned within-session, trial-to-trial reliability rather than between-session reproducibility. In contrast, previous findings for the IS have been more variable. Ha et al. [18] reported intra-session reliability of normalized sEMG measures during isometric contractions across three different resistance methods, resulting in considerable variation in ICC point estimates. Examiner-resisted MVCs demonstrated an ICC of 0.42, while MVCs assessed using a digital tension meter yielded an ICC of 0.73. The highest reliability was observed for cable-resisted submaximal contractions, with an ICC of 0.98. Conversely, Cooper and Karduna [19] reported more consistent findings, with ICCs indicating poor between-session reliability for the IS across several standardised submaximal contraction intensities. Collectively, these findings suggest that the reproducibility of sEMG amplitude depends on the muscle–exercise condition and the specific contraction, standardisation, and signal-processing procedures used.

The observed ICC estimates differed substantially between the two muscle–exercise conditions, with numerically higher relative reliability for VMO than for IS measurements. However, this difference cannot be attributed to muscle anatomy alone, because the muscles were assessed during different exercises and differed in signal amplitude and between-subject variability. The lower between-subject variability observed for IS may have contributed to its lower ICC, as ICC is influenced by the relative magnitude of between- and within-subject variability. Thus, lower between-subject heterogeneity can result in lower ICC values despite comparable measurement error. [10, 20]. Moreover, the SEM and wide limits of agreement observed for both muscles indicate that relatively high ICC estimates do not necessarily imply close agreement between repeated measurements [21]. Consequently, small individual changes in sEMG amplitude may be difficult to distinguish from measurement error under the conditions examined. This is consistent with previous research reporting differences in sEMG reliability across muscles [22].

When interpreting repeated measurements, relative reliability should be considered alongside absolute measurement error [7]. Although the VMO measurements generally preserved participants' relative ranking across sessions, SEM values of 14.2% to 16.2% and the wide limits of agreement indicate considerable uncertainty when interpreting individual change. Measurement uncertainty was greater for the IS, with SEM values of 18.3% to 24.0% and wide limits of agreement across all conditions. Consequently, small between-session differences in sEMG amplitude should not automatically be

interpreted as changes in muscle excitation. Repeated measurements may be most informative when testing conditions are closely standardised and observed changes clearly exceed the expected measurement variation.

This study has several methodological strengths. To minimise avoidable procedural variation, all measurements followed a standardised protocol covering participant instructions, skin preparation, electrode placement, warm-up and familiarisation procedures, exercise order and execution, movement tempo, rest intervals, and data collection. The testing protocol was also pilot tested before data collection to improve procedural consistency. Each participant was assessed by the same examiner at both sessions, reducing examiner-related variation and allowing within-examiner repeatability to be evaluated under standardized conditions. Furthermore, the combined reporting of ICC, SEM, mean differences and limits of agreement provided information on both relative and absolute reliability.

Nevertheless, several limitations should be considered when interpreting the findings. Dynamic contractions introduce potential variation from changes in muscle geometry, sensor movement, and exereaximncise execution [23, 24], although dynamic conditions did not consistently yield lower ICC estimates than the isometric conditions. Because each participant was assessed by the same examiner at both sessions, the findings represent within-examiner repeatability and do not establish reproducibility across examiners. Furthermore, the young, healthy, resistance-trained sample limits generalisability to clinical populations, in whom pain, weakness, and altered motor control may affect measurement reproducibility [25]. The feasibility-based sample of 14 participants limited the precision of the reliability and agreement estimates, as reflected in the confidence intervals around the ICCs and the uncertainty of the limits of agreement. No a priori sample-size calculation based on a target ICC or desired confidence-interval width was performed; consequently, the findings should be considered exploratory [26, 27]. No a priori sample-size calculation based on a target ICC or desired confidence-interval width was performed, and the findings should therefore be considered exploratory. In addition, the aforementioned sensitivity of ICC to between-subject heterogeneity may have affected IS reliability more than VMO reliability due to differences in between-subject variability [10, 20]. The analyses were based on absolute sEMG amplitude rather than normalized values. This approach reflects the reproducibility of the system's direct output but may increase sensitivity to differences in electrode placement, tissue properties, and recording conditions between sessions [28]. Conversely, normalization would have introduced additional variability from the reference contraction. Finally, the study evaluated the reproducibility of the complete measurement procedure and cannot isolate device-related error from biological and procedural variation. The findings are specific to the MyoAct system and its proprietary processing pipeline. Although sampling frequency, RMS epoch length, and calculation of the exported outcome were available, complete filtering and onboard signal-processing specifications were not. This limits methodological transparency, independent replication, and comparison with other sEMG systems.

Future studies should evaluate Myoact sEMG measurements in larger and clinically relevant populations and include assessments of between-examiner reliability. Further research should also investigate whether more detailed standardisation of sensor placement and contraction procedures can reduce

between-session measurement error. Comparison with an established laboratory-based sEMG system may help distinguish device-related variation from variation introduced by the overall testing procedure.

CONCLUSION

In conclusion, Myoact surface electromyography measurements demonstrated moderate-to-good relative test–retest reliability for the vastus medialis during knee extension, whereas reliability was poor for the infraspinatus during shoulder external rotation, based on the lower bounds of the 95% confidence intervals for the intraclass correlation coefficients. Measurement error and wide limits of agreement were observed for both muscle–exercise conditions, indicating that small between-session differences in individual surface electromyography amplitude should be interpreted with caution. These findings apply to the tested procedures in young, healthy adults and should not be generalised to other muscles, examiners, testing conditions, or clinical populations without further investigation.

Declarations

Human and Animal Rights/Ethics approval

Formal research ethics committee approval was not required following institutional assessment.

Patient consent statement

All participants provided written informed consent.

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Author contributions: SF: conceptualization, data curation, formal analysis, investigation, methodology, project administration, resources, validation, visualization, writing – original draft, writing review & editing. NB: conceptualization, data curation, formal analysis, investigation, methodology, project administration, resources, validation, visualization, writing review & editing. SLJ: Supervision, validation, writing – original draft, writing – review & editing.

Role of the manufacturer: The manufacturer had no role in the study design, data collection, analysis, interpretation, manuscript preparation, or decision to submit the manuscript.

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Figures

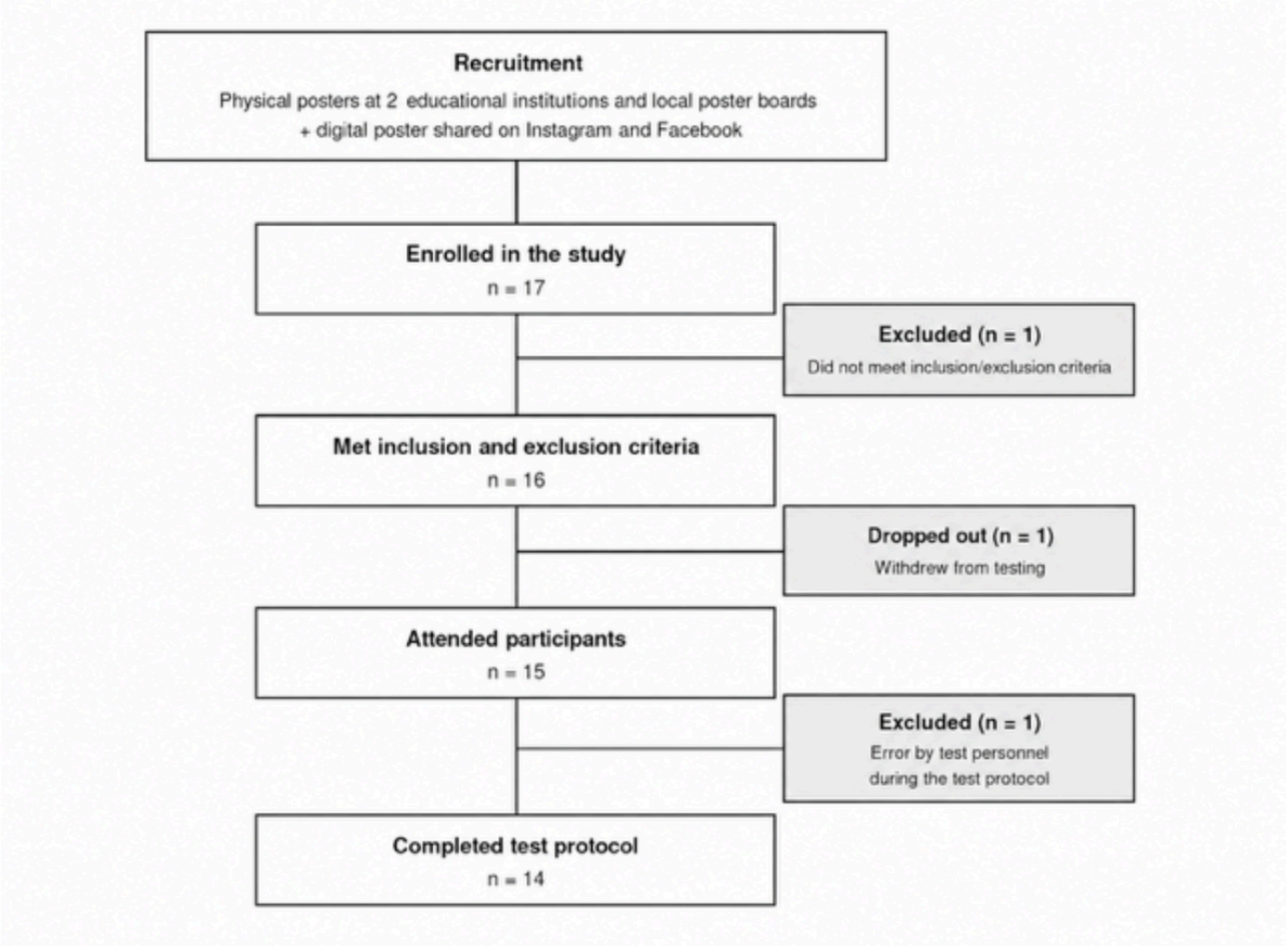


Figure 1

Flowchart of the recruitment process

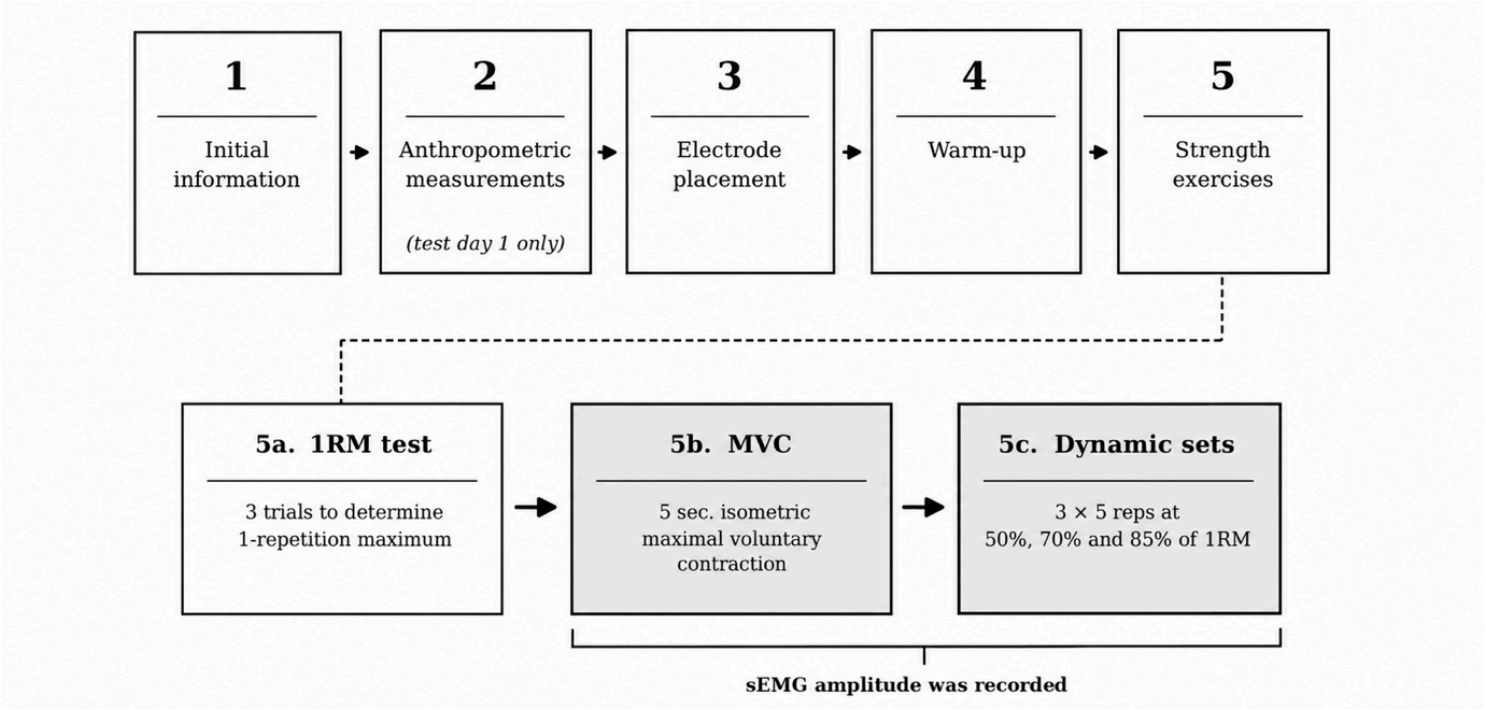


Figure 2

Flowchart of the assessment protocol.



Figure 3

Illustration of the resistance exercises (1) leg extension and (2) shoulder external rotation, including electrode placement for the m. vastus medialis and m. infraspinatus, respectively.

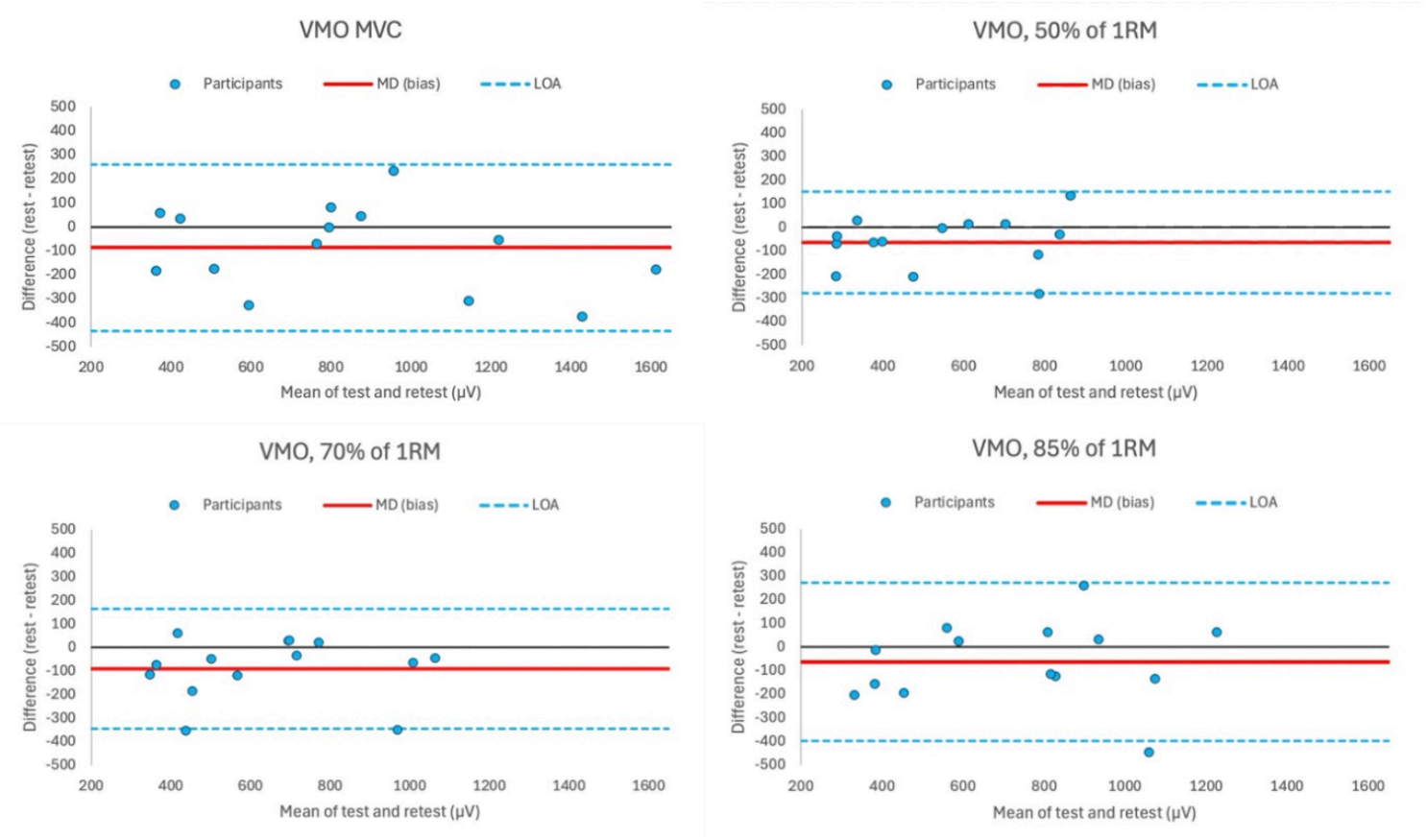


Figure 4

Bland-Altman plots for test minus retest measurements (n=14) with Myoact surface-electromyography on vastus medialis obliquus (VMO) during leg extension. MVC = isometric maximal voluntary contraction (5 sec.), 50%, 70% and 85% of 1RM = percentages of one-repitition maximum during a dynamic set of 5 repetitions. MD = mean of differences, LOA = limits of agreement (lower and upper), µV = microvolts.

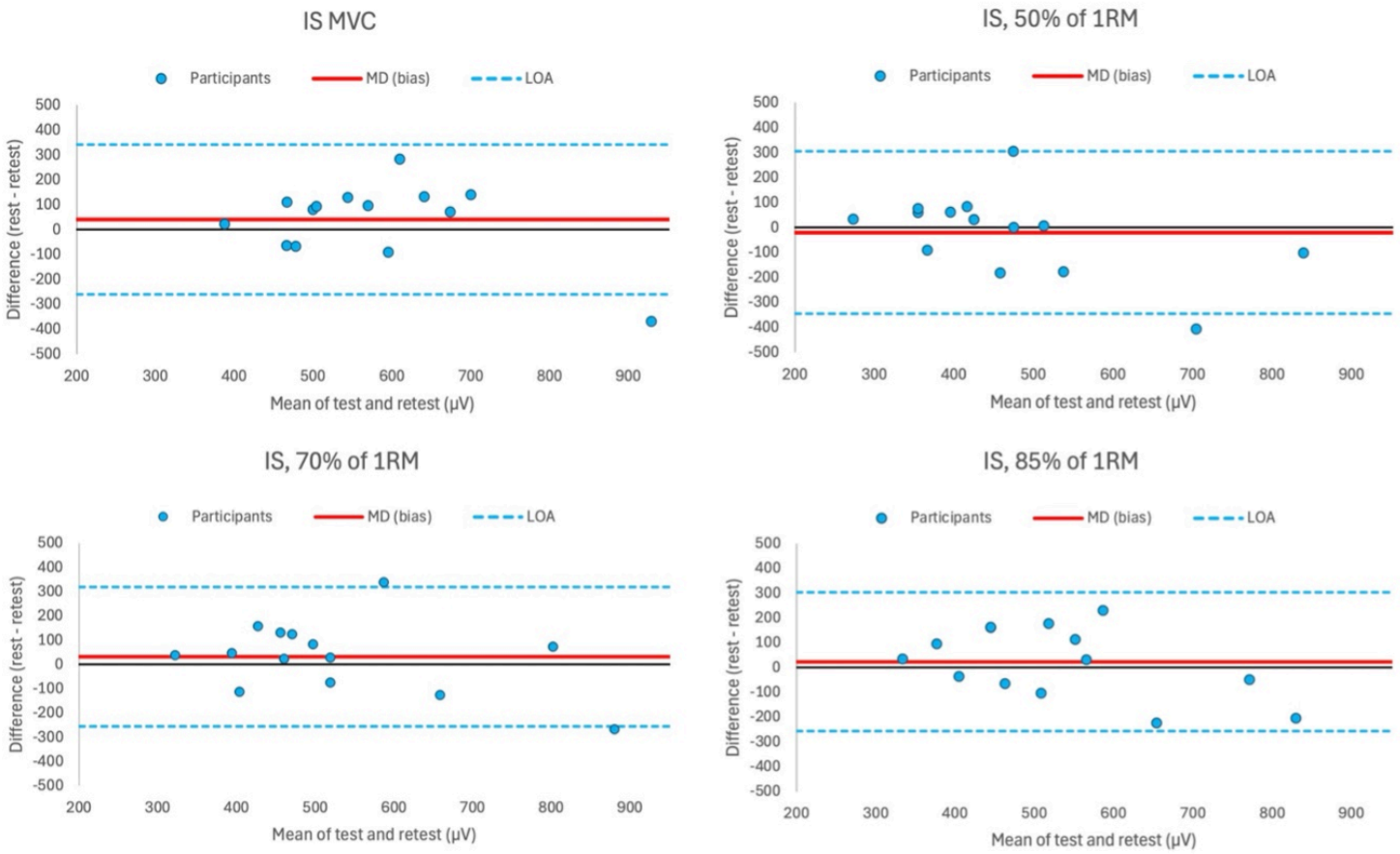


Figure 5

Bland-Altman plots for test minus retest measurements (n=14) with Myoact surface-electromyography on the infraspinatus (IS) muscle during shoulder external rotation. MVC = isometric maximal voluntary contraction (5 sec.), 50%, 70% and 85% of 1RM = percentages of one-repetition maximum during a dynamic set of 5 repetitions. MD = mean of differences, LOA = limits of agreement (lower and upper), µV = microvolts.