COMPARISON OF THE VALIDITY AND RELIABILITY OF THREE DIFFERENT METHODS USED FOR WRIST PROPRIOCEPTION MEASUREMENT

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Statistical Analysis

Statistical analysis was performed using the SPSS version 28 (IBM, Armonk, NY) computer software system. The Normality of the variables was tested using the Shapiro-Wilk test. Since the data were non-parametric, the validity analysis was performed using Spearmen's correlation test. The validity of these three methods was calculated according to their correlation with the isokinetic dynamometer data. Correlation coefficients was used to interpret the results. The correlation coefficient was defined as follows: between 0.90-1.00 was very high, between 0.70-0.90 was high, between 0.50-0.70 was medium, between 0.30-0.50 was weak, and less than 0.30 was negligible (Mukaka, 2012). The statistical significance level was determined as $p<0.05$ for all analyses.

The Intraclass Correlation Coefficients $ICC_{3,1}$ (two-way mixed, absolute agreement) were calculated for test-retest reliability analysis. The $ICC_{2.1}$ value that was greater than 0.90 was defined as an excellent correlation, a good correlation between 0.75 and 0.90, a moderate correlation between 0.50-0.75 and a poor correlation if less than 0.50 (Koo & Li, 2016). Measurement errors of the three methods were used to calculate standard error of measurement (SEM) and Minimal Detectable Change (MDC) in a 95% confidence interval (Haley & Fragala-Pinkham, 2006; Suner-Keklik et al., 2017).

RESULTS

A total of 32 participants (64 wrists) were evaluated in the study (Figure 5). Demographic characteristics are presented in Table 1.

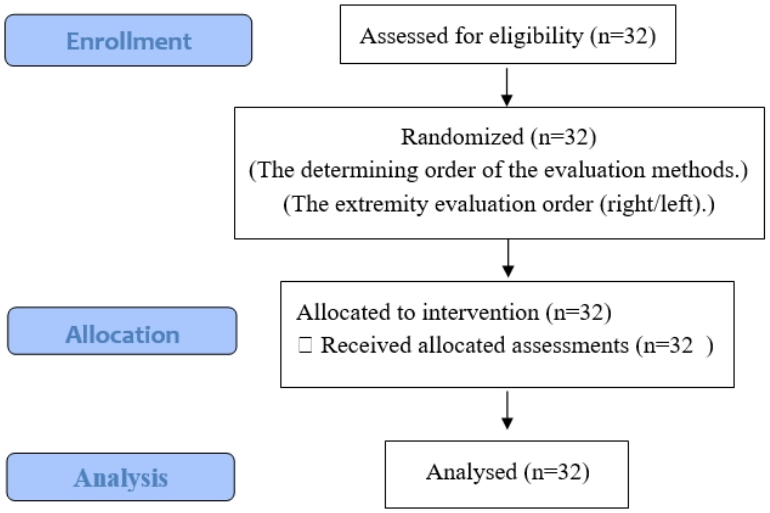

Table 1. Demographic features

	Minimum	Maximum	Mean ± S.D.
Age	19.00	31.00	23.34 ± 3.84
Height	160.00	193.00	173.66 ± 8.87
Weight	48.00	115.00	68.31 ± 13.75
BMI	17.56	33.97	22.52 ± 3.29

BMI: Body Mass Index

The results of the validity analysis of the methods are displayed in Table 2. The validity of these methods was found to be weak for the inclinometer and JPSG and moderately for the goniometer (Mukaka, 2012) (Table 2).

Table 2. The results of validity analysis and descriptive statistics of the methods

Methods	Median (25th per – 75th per)	r	P
Isokinetic dynamometer	3.17° (2.33° – 4.83°)	-	-
Inclinometer	3.66° (2.66° – 5.83°)	0.350	**0.005***
Goniometer	3.50° (2.33° – 4.66°)	0.529	**<0.001***
JPSG	2.50° (1.66° – 3.33°)	0.432	**<0.001***

per: percentile, r: correlation coefficient, °: degree,*: p<0.05

The results of the test-retest reliability analysis of the methods are displayed in table 3. The inclinometer was not found to be a reliable method for evaluating AJPS while the goniometer and JPSG were detected to have significant test-retest reliability. However, the 95% confidence intervals of the goniometer and JPSG were poor (Koo & Li, 2016) (Table 3).

Table 3. The results of test-retest reliability analysis and descriptive statistics

Methods	1st Measurement	2nd Measurement	$ICC_{3,1}$	P	SEM	MDC
	Median (25 per – 75 per)	Median (25 per – 75 per)				
Inclinometer	5.33° (3.33° – 8.17°)	4.50° (2.83° – 6.33°)	0.114	0.183	0.11	0.25
Goniometer	3.50° (2.33° – 5.66°)	3.66° (2.33° – 4.83°)	0.422	**<0.001***	0.32	0.75
JPSG	2.33° (1.33° – 3.33°)	2.00° (1.33° – 3.33°)	0.369	**0.001***	0.29	0.68

(per: percentile, r: correlation coefficient, °: degree, *: p<0.05)

The order in which each method was evaluated is presented in Table 4.

Table 4. The sequences of methods

Methods	First	Second	Third
Goniometer	23 (% 35.9)	24 (% 37.5)	17 (% 26.6)
Inclinometer	19 (% 29.7)	20 (% 31.2)	25 (% 39.1)
JPSG	22 (% 34.4)	20 (% 31.2)	22 (% 34.4)

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