Validity of an automated GNSS-IMU system in temporal biathlon range work analysis

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INTRODUCTION

The purpose of this study was to examine the validity of a commercial wearable wireless GNSS-IMU system (Archinisis) in automated temporal biathlon range work analysis

METHODS

- 12 biathletes skied 12 laps around the shooting range and performed six times a 5-shot set of biathlon shooting from the prone and standing postures
- Temporal range work characteristics were simultaneously measured with
    - a wearable GNSS-IMU sensor
        - Naos sensor for biathlon by Archinisis
    - a high-speed video camera

Variable	Description
Approaching	Range entry to mat entry
Preparing	Mat entry to the 1st shot
Shot interval	Time between consecutive shots
Total shooting	Time between the 1st and last shot
Mat off	From the last shot to mat exit
Leaving	From mat exit to range exit
Range time	From range entry to range exit
Mat time	From mat entry to mat exit

STRONG RELATIONSHIPS BETWEEN METHODS WERE OBSERVED
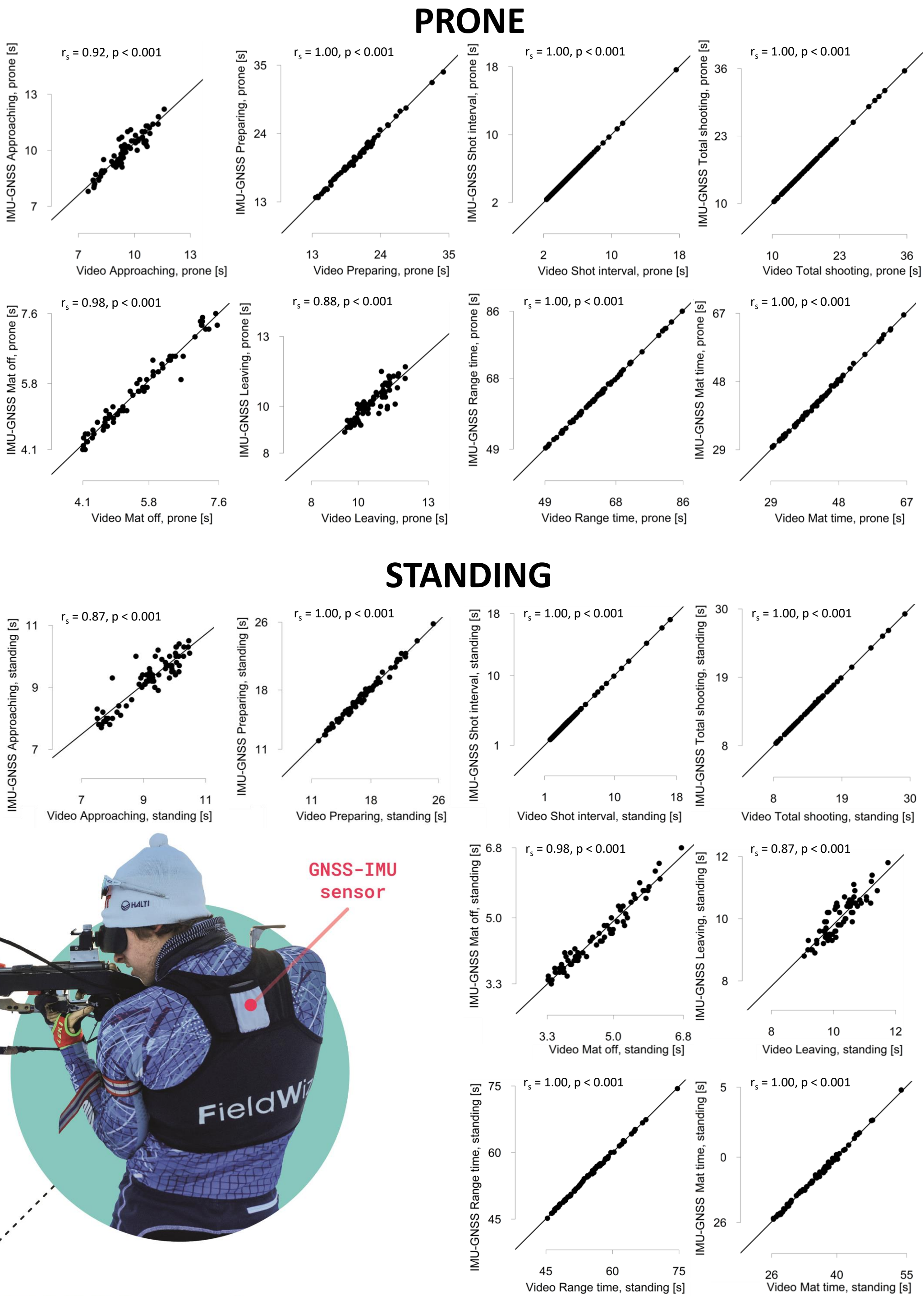
r_s = two-tailed Spearman's rank correlation

RESULTS

	Prone		Standing	
	MAE (s)	CV%$_{RMS}$	MAE (s)	CV%$_{RMS}$
Approaching	0.47 ± 0.31	4.1	0.27 ± 0.26	2.9
Preparing	0.19 ± 0.17	0.9	0.29 ± 0.19	1.4
Shot interval	0.006 ± 0.004	0.1	0.009 ± 0.010	0.3
Total shooting	0.02 ± 0.01	0.1	0.03 ± 0.04	0.2
Mat off	0.14 ± 0.13	2.5	0.15 ± 0.11	2.9
Leaving	0.46 ± 0.31	3.7	0.29 ± 0.18	2.4
Range time	0.17 ± 0.12	0.2	0.15 ± 0.11	0.2
Mat time	0.24 ± 0.20	0.5	0.28 ± 0.20	0.7

MAE = mean absolute error

CV%$_{RMS}$ = root-mean-squared coefficient of variation percentage

CONCLUSION

Temporal biathlon range work characteristics can be measured with reasonable accuracy with the Archinisis GNSS-IMU system.

The Archinisis system can be used to collect data on biathletes' range work performance for coaching and research purposes.

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