

# A COMPARISON OF DEVICES FOR THE MEASUREMENT OF SPIROMETRY IN NORMAL HEALTHY SUBJECTS AND PATIENTS WITH RESPIRATORY DISEASE



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## Introduction

The aim of this study was to establish the accuracy of spirometry measurements produced by a newly developed turbine spirometer (SpiroConnect, MedChip Solutions, Kent, UK) in comparison to those obtained from a pitot-type spirometer (MGC Ultima, Minnesota, USA). Recorded data was analysed to establish whether the spirometers measured differently in subjects with a range of lung pathologies routinely having spirometry.



## Methods

49 subjects performed spirometry on the two spirometers in a randomised order during one test session according to ARTP/BTS guidelines (*Respir Med* 1994; 88: 165-194). The subjects included healthy volunteers (n=10), and patients with lung disease (restrictive disease n=15, obstructive disease n=24).

Measurements of FEV<sub>1</sub>, FVC, FEV<sub>1</sub>/FVC, MEF<sub>75-25</sub>, VC and Forced Expiratory Time (FET) were compared using Pearson's correlation and a paired two-tailed t-tests.

## Results

Very strong, positive correlations (p<0.0001) were observed between the devices for FEV<sub>1</sub> and FVC (Figure 1) and there were no statistically significant differences observed in any clinically important measure (Table 1). No differences were observed between subject groups in terms of correlation of the devices.

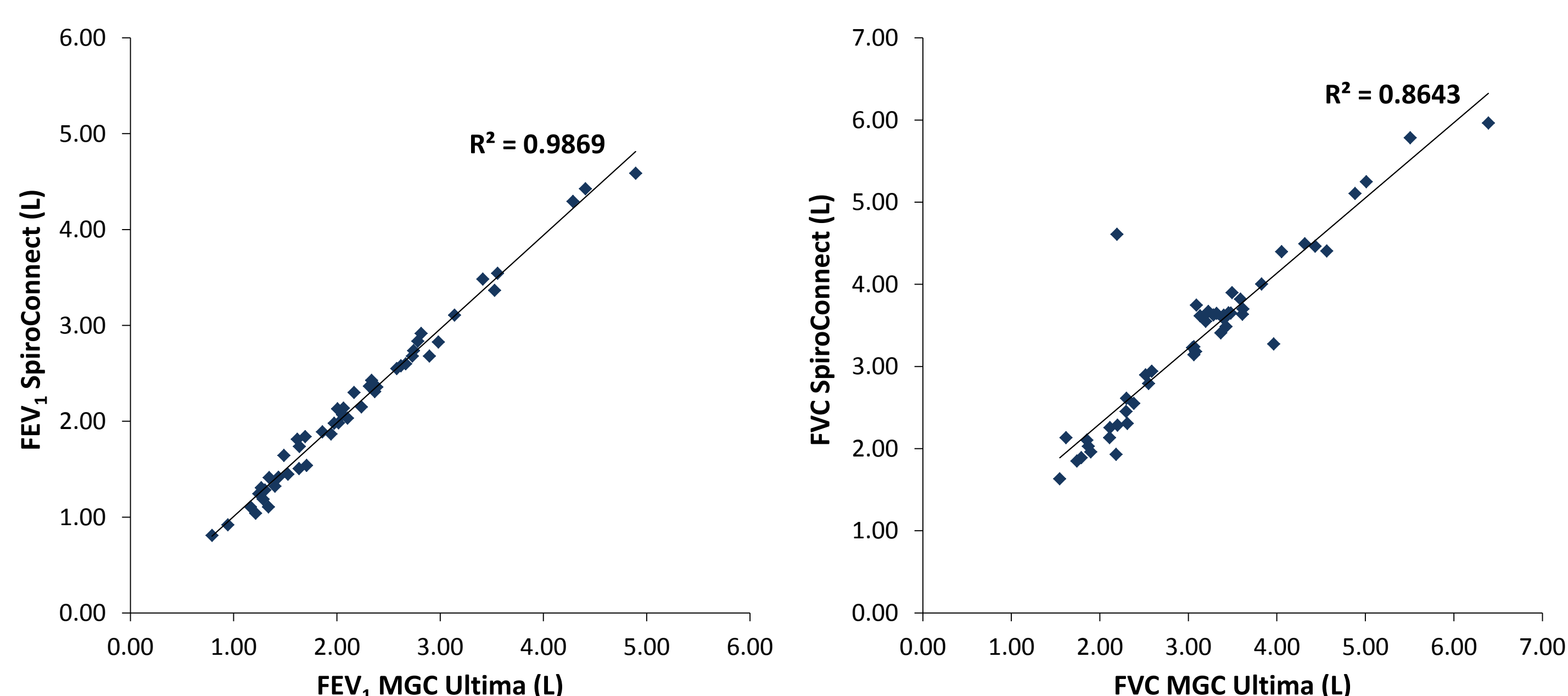


Figure 1: Relationship between FEV<sub>1</sub> (left) and FVC (right) on the MGC Ultima and Spiroconnect spirometers in all subjects (n=49).

MGC ULTIMA		FEV1 (L)	FVC (L)	FEV1/FVC (%)	PEF (L/s)	MEF <sub>75-25</sub> (L/s)	FET (s)	VC (L)
	Mean		2.20	3.13	70.63	6.42	1.83	9.12
SD		0.91	1.05	15.06	2.06	1.29	3.31	1.07
SPIROCONNECT		FEV1 (L)	FVC (L)	FEV1/FVC (%)	PEF (L/s)	MEF <sub>75-25</sub> (L/s)	FET (s)	VC (L)
	Mean		2.18	3.34	65.41	6.78	1.56	10.91
SD		0.90	1.04	15.32	2.24	1.25	4.44	1.06
p		NS	NS	NS	NS	NS	0.03	NS

Table 1: Summary of spirometric parameters obtained from both devices

There were no statistically significant differences in FEV<sub>1</sub>, FVC, VC or PEF or MEF<sub>75-25</sub> but there was a significant difference in FET, where the SpiroConnect measured FET 1.8 seconds longer (p=0.03). Although not statistically different, the SpiroConnect also measured FVC 210ml greater on average. Bland-Altman plots for FEV<sub>1</sub>, FVC, VC and FET are shown in Figures 2-5, respectively, with the grey area indicating a ± 200ml intra-device acceptability.

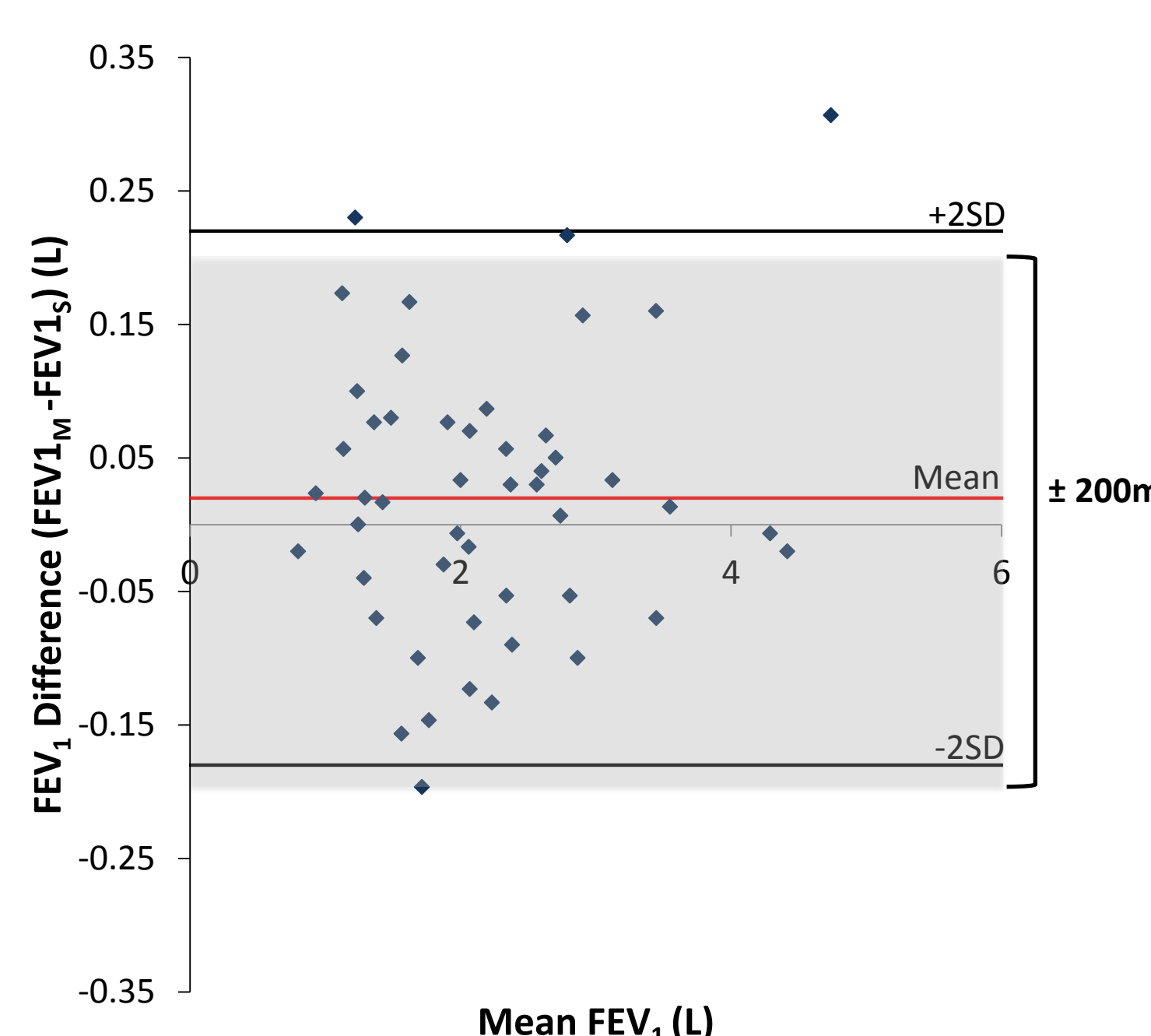


Fig. 2. Bland -Altman plot comparing FEV<sub>1</sub> measured by MGC Ultima (M) and Spiroconnect (S) spirometers. Grey area indicates ±200 ml intra-device acceptability.

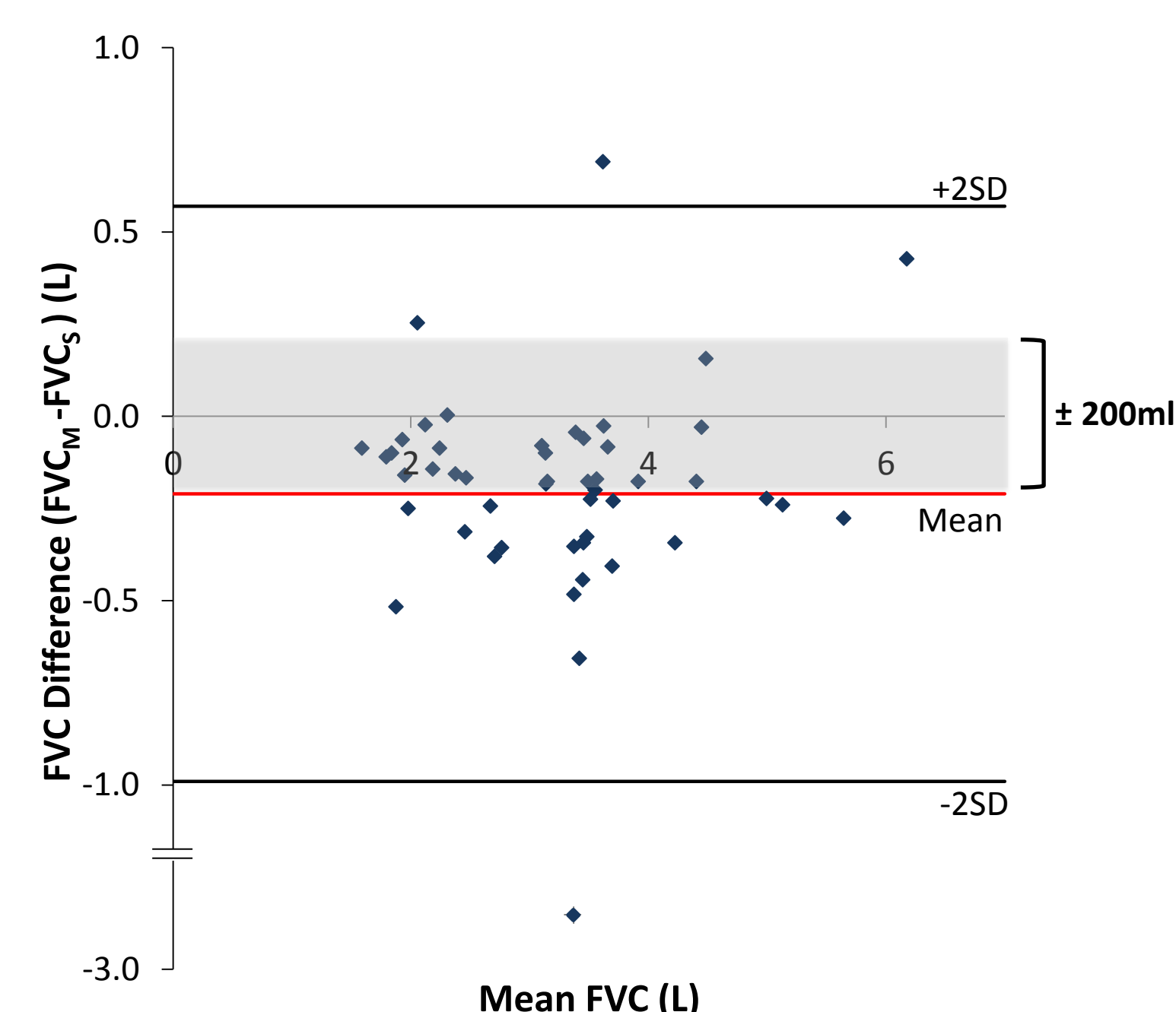


Fig. 3. Bland -Altman plot comparing FVC measured by MGC Ultima (M) and Spiroconnect (S) spirometers. Grey area indicates ±200 ml intra-device acceptability.

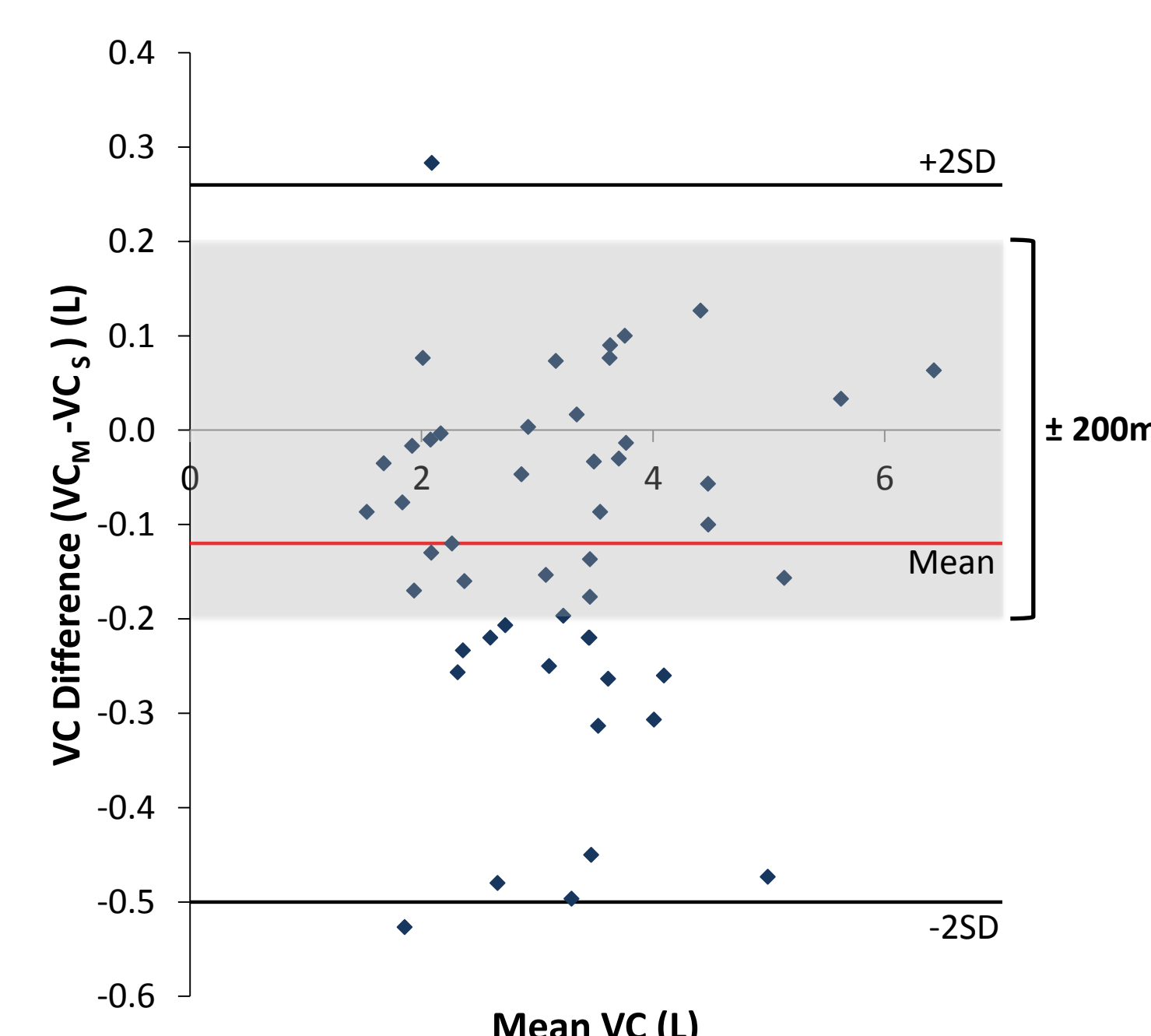


Fig. 4. Bland -Altman plot comparing VC measured by MGC Ultima (M) and Spiroconnect (S) spirometers. Grey area indicates ±200 ml intra-device acceptability.

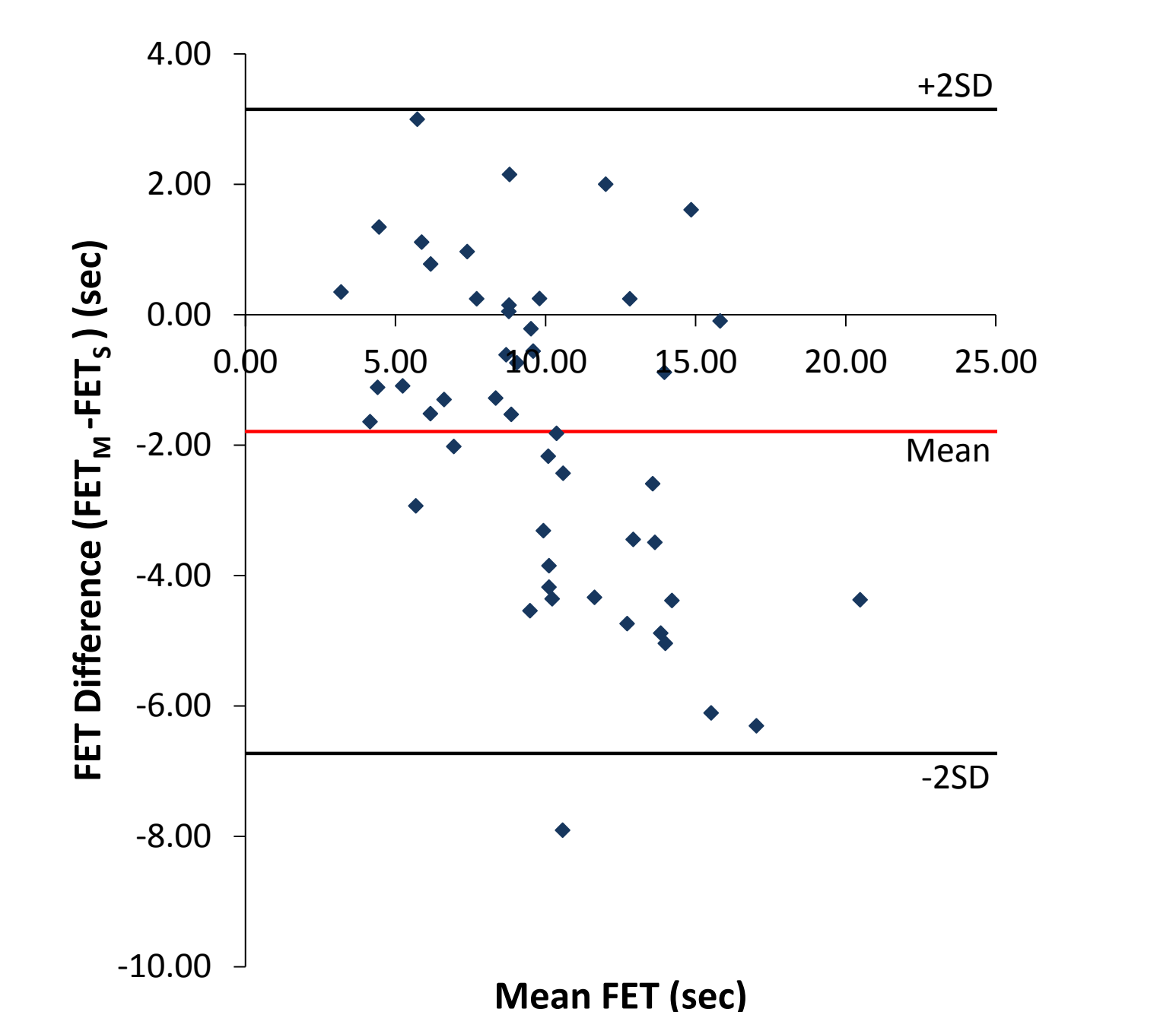


Fig. 5. Bland -Altman plot comparing FET measured by MGC Ultima (M) and Spiroconnect (S) spirometers. Grey area indicates ±200 ml intra-device acceptability.

## Conclusions

No clinically significant differences in the FEV<sub>1</sub> or VC measurements occurred in the two devices. However, the SpiroConnect generally measured expiratory flow for longer, leading to a difference in FVC greater than 200ml in a number of subjects.