

Increased neuromuscular activity and rate of force development after high load resistance training in patients undergoing dialysis.

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REGION

Aim. To investigate the effects of high load resistance training on neuromuscular function and rate of force development in patients undergoing dialysis.

Design. Before-after trial.

Patients. 29 patients undergoing dialysis.

Intervention. 16 weeks of resistance training thrice weekly. The training comprised leg press, knee extension, and knee flexion.

Main outcome measures.

- Neuromuscular function using surface EMG in the vastus lateralis muscle during dynamic knee extension in an one repetition maximum test.
- Knee extension rate of force development using the Good Strength dynamometer chair.
- Knee extension and leg press muscle strength in one repetition maximum tests.
- Muscle fibre sizes in muscle biopsies from the vastus lateralis muscle.

Table 1. Patients (n=29)

Age (years)	55 (3)
Female/male	13/16
HD/PD	24/5
Dialysis (years)	5.0 (5.7)
BMI (kg/m ²)	24.6 (5.2)
Haemoglobin (mmol/l)	7.5 (1.0)
Albumin (g/l)	41.2 (3.2)
Phosphate (mmol/l)	1.62 (0.48)
Bicarbonate (mmol/l)	25.1 (3.5)
CRP (mg/l)	6.6 (6.6)
Mean (SD)	

Table 2. Results.

1RM knee extension (kg)	56 ± 5	82 ± 8**
1RM leg press (kg)	91 ± 8	213 ± 16**
Rate of force development		
Knee extension, right (N/s)	1472 ± 134	1788 ± 176*
Knee extension, left (N/s)	1244 ± 134	1722 ± 185*
EMG frequency 0-1000 ms (Hz)	77.4 ± 7.6	78.9 ± 4.2

Mean (SEM). *p<0.05; **p<0.001

Conclusions. The improved muscle strength after 16 weeks of resistance training was achieved in parallel with greater rate of force development and improvements in neuromuscular functions.

The results suggest that resistance training is not only associated with increased muscle strength due to improved neuromuscular activity but also with a greater rate of force development, which may have important implications in terms of physical performance.

Figure 1. EMG amplitude in m. vastus lateralis During dynamic muscle contraction. *p<0.05.

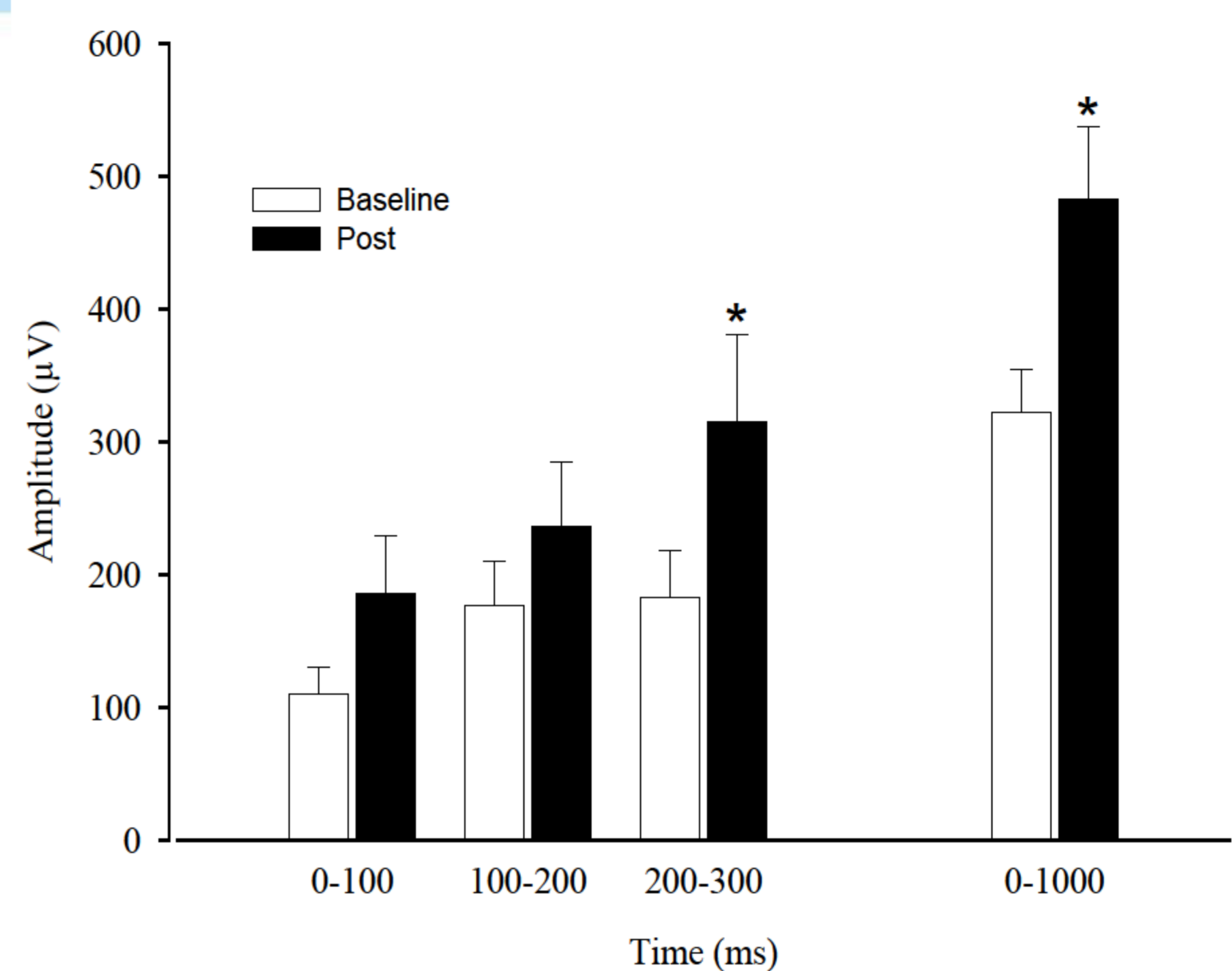


Figure 2. EMG amplitude in m. vastus lateralis during isometric knee extension at 50% of 1RM.

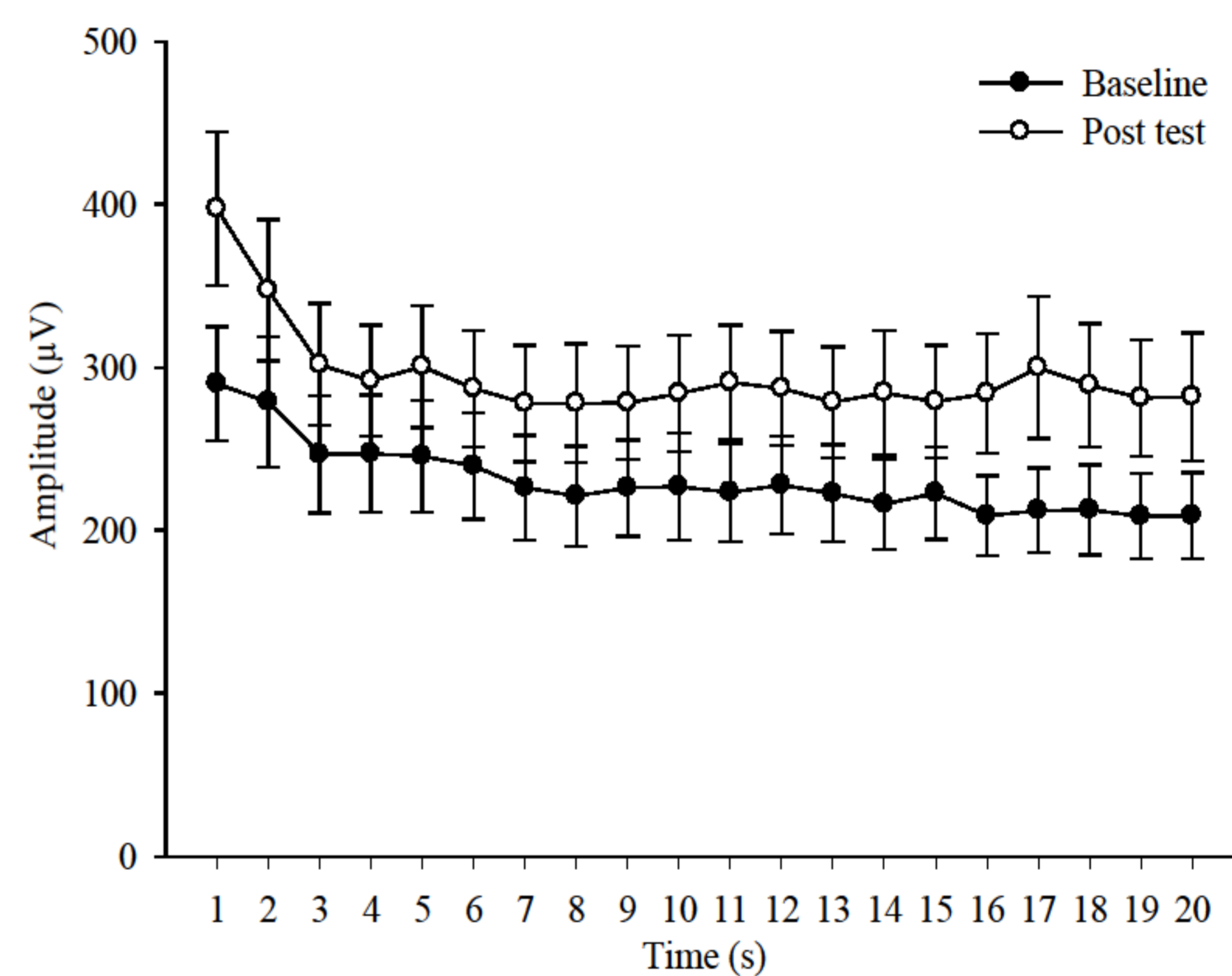


Figure 3. Association between Δ-type 2 muscle fibre CSA and right leg Δ-rate of force development during the training period.

