

Figure 1. :

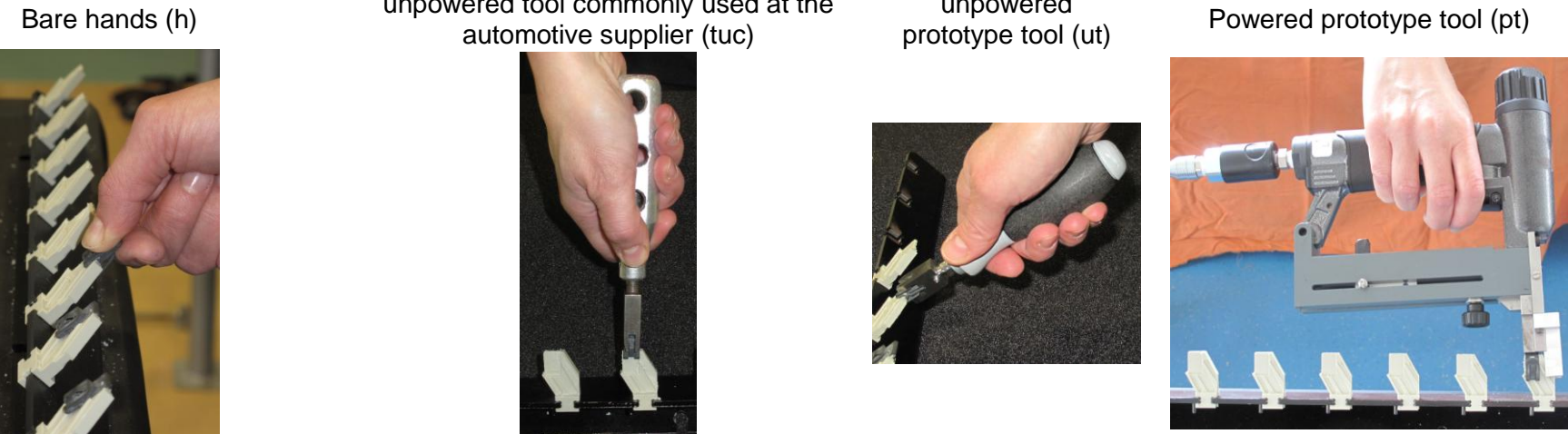


Figure 2

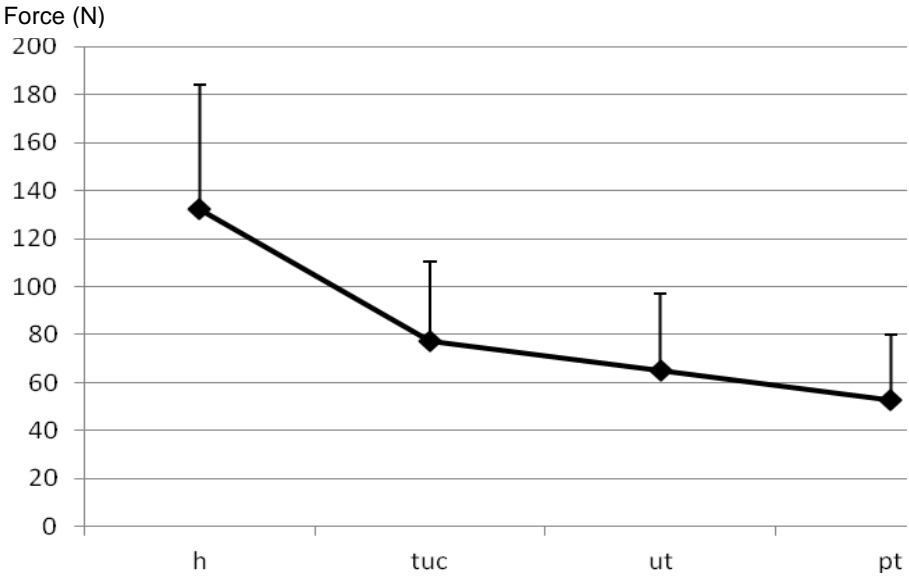
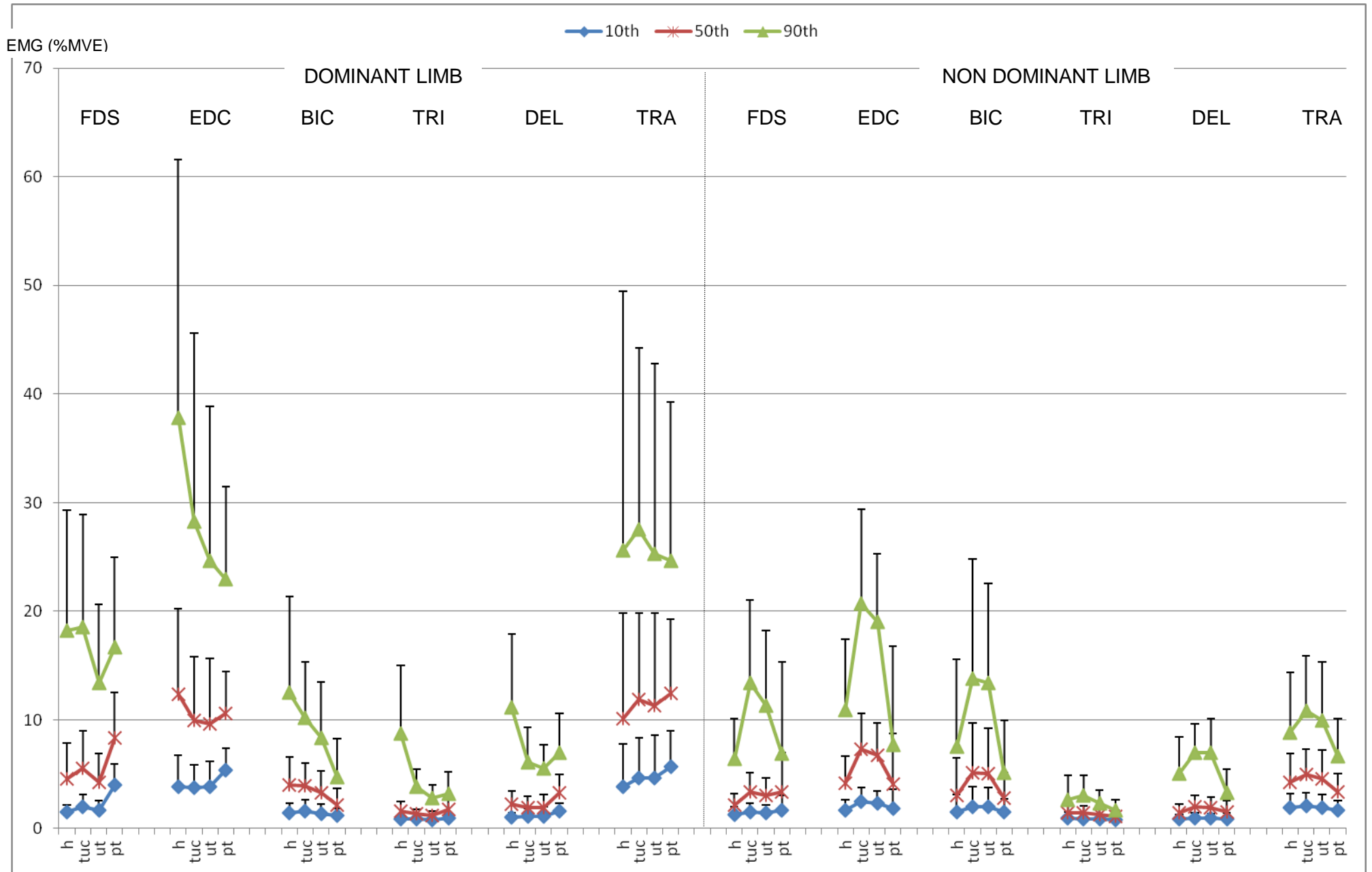


Figure 3



Highlights:

The study compared muscular activity and external force for 4 clip fitting methods.

Muscle activity of the dominant limb was lower when using the unpowered tools.

Non-dominant limb muscle activity was lower with bare-hand or powered-tool fitting.

However, fitting clips with the bare hand required a higher external force.

Thus, measuring the external force alone may give rise to an erroneous interpretation.

Table 1:

		ANOVA	Difference between two fitting methods > fitting method residual error (number of subjects affected by this difference with n=11)
Resultant external force	90th	p≤0.001	h>ut (11), h>pt(8), h>tuc (8), tuc>pt (6)
Muscles of the dominant limb			
Flexor digitorum superficialis	10th	p≤0.001	pt>ut (11), pt>h (11), pt>tuc (10)
	50th	p≤0.001	pt>h (8) / h>pt (1), pt>ut (7), pt>tuc (7) / tuc>pt (1)
	90th	p≥0.05	
Extensor digitorum communis	10th	p=0.006	pt>tuc (7) / tuc>pt (2), pt>ut (7) / ut>pt (2), pt>h (7) / h>pt (2)
	50th	p≥0.05	
	90th	p=0.002	h>ut (9) / ut>h (1), h>pt (7), h>tuc (5) / tuc>h (2)
Biceps brachii	10th	p≤0.001	tuc>pt (8), tuc>ut (5)
	50th	p≤0.001	tuc>pt (8), h>pt (7), ut>pt (6)
	90th	p≤0.001	h>pt (9), h>ut (9), tuc>pt (7), ut>pt (6)
Triceps brachii	10th	p=0.002	pt>ut (9), pt>h (6) / h>pt (1), pt>tuc (5) / pt>tuc (1)
	50th	p=0.012	h>ut (5), h>pt (4) / pt>h (3)
	90th	p≤0.001	h>ut (10) / ut>h (1), h>pt (8), h>tuc (8) / tuc>h (1)
Deltoideus anterior	10th	p≤0.001	pt>ut (10) / ut>pt (1), pt>h (9), pt>tuc (9) / tuc>pt (1)
	50th	p=0.003	pt>ut (10) / ut>pt (1), pt>tuc (9) / tuc>pt (1), pt>h (5) / h>pt(1)
	90th	p≤0.001	h>ut (8) / ut>h (1), h>pt (7), h>tuc(6)
Trapezius pars descendens	10th	p≤0.001	pt>ut (7), pt>h (7) / h>pt (1), tuc>h (7) / h>tuc (1)
	50th	p=0.041	pt>h (7) / h>pt (1), tuc>h (4) / h>tuc (1)
	90th	p≥0.05	
Muscles of the non dominant limb			
Flexor digitorum superficialis	10th	p≥0.05	
	50th	p≥0.05	
	90th	p≤0.001	tuc>h (8), ut>pt (8) / pt>ut (1), tuc>pt (6) / pt>tuc (1), ut>h (5)
Extensor digitorum communis	10th	p=0.046	tuc>pt (6) / pt>tuc (1)
	50th	p≤0.001	ut>pt (8) / pt>ut (1), tuc>pt (7), tuc>h (5) / h>tuc (1), ut>h (4) / h>ut (1)
	90th	p≤0.001	tuc>pt (8), ut>pt (8), tuc>h (5), h>pt (4), ut>h (3)
Biceps brachii	10th	p=0.043	ut>h (3)
	50th	p≤0.001	ut>pt (7), tuc>pt (6), tuc>h (4), ut>h (3)
	90th	p≤0.001	tuc>pt (8), ut>pt (7), ut>h (6), tuc>h (5)
Triceps brachii	10th	p≥0.05	
	50th	p≥0.05	
	90th	p≤0.001	tuc>pt (11), ut>pt (6), h>pt (5)
Deltoideus anterior	10th	p≥0.05	
	50th	p=0.002	tuc>pt (9) / pt>tuc (2), ut>pt (7) / pt>ut (1), ut>h (6) / h>ut (1), tuc>h (5)
	90th	p≤0.001	ut>pt (10), tuc>pt (8), h>pt (7), tuc>h (6) / h>tuc(2), ut>h (6) / h>ut (2)
Trapezius pars descendens	10th	p≥0.05	
	50th	p≥0.05	
	90th	p=0.016	tuc>pt (8), mt>pt (6) / pt>mt (1), tuc>h (3) / h>tuc (2)

A better way of fitting clips? A comparative study with respect to physical workload

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