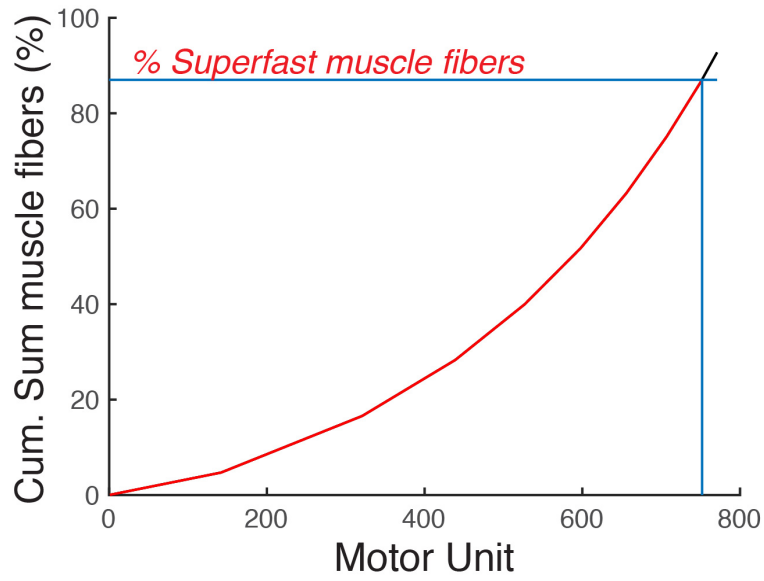


**Figure S1. Force-based and connectome-based MU distributions follow exponential distributions related to Figure 2A.** A - D) Force-based MU size distributions. E - F) connectome-based size distributions. G - L) Accompanying MU number as a function of force step or MU size. We fitted the exponential function:  $y=y_1*\exp(b*x)$ , where  $b=\ln(R)/n$  and  $R=y_{max}/y_1$  using nonlinear curve fitting minimizing least squares.

B9W9, INmean=3.66



**Figure S2. Cumulative fraction of muscle fibers with MU number allows for MU correction per muscle fiber type related to Figure 2B, 2C.** Of all muscle fibers 87% do not react to the fast myosin antibody my32 [16] and are most likely of the superfast fiber type.

	Number of Muscle Fibers				CSA (mm <sup>2</sup> )				CSA / Fiber (μm <sup>2</sup> )				Number of NXIIIs Fibers				Innervation Number 0% Sensory Axons			
	Mean ± SD	Range	n	Welch t-test	Mean ± SD	Range	n	Welch t-test	Mean ± SD	Range	n	Welch t-test	Mean ± SD	Range	n	Welch t-test	Mean ± SD	Range	n	Welch t-test
Left	3234 ± 232	2992 - 3503	4	t (5.4) = -2.8, p = 0.04	2.50 ± 0.57	1.78 - 3.17	4	t (6) = -0.63, p = 0.55	826 ± 167	532 - 905	4	t (6.0) = -0.62, p = 0.56	820 ± 187	602 - 1162	8	t (10.2) = 0.32, p = 0.76	4.47 ± 0.78	3.85 - 5.55	4	t (4.98) = -1.5, p = 0.18
Right	3794 ± 334	3586 - 4286	4		2.75 ± 0.58	2.29 - 3.54	4		765 ± 85	638 - 826	4		790 ± 148	677 - 1045	5		5.2 ± 0.53	4.63 - 5.67	3	
Sides Pooled	3514 ± 400	2992 - 4286	8		2.63 ± 0.55	1.78 - 3.54	8		748 ± 126	532 - 905	8		809 ± 167	602 - 1162	13		4.78 ± 0.75	3.85 - 5.67	7	
VS Left	1045 ± 104	922 - 1161	4	t (5.9) = -0.79, p = 0.46	1.05 ± 0.19	0.87 - 1.31	4	t (4.4) = 0.63, p = 0.56	1008 ± 157	795 - 1128	4	t (4.7) = 1.31, p = 0.25								
VS Right	1107 ± 115	946 - 1197	4		0.99 ± 0.09	0.88 - 1.09	4		894 ± 87	798 - 1000	4									
Sides Pooled	1076 ± 107	922 - 1197	8		1.02 ± 0.14	0.87 - 1.31	8		951 ± 132	795 - 1128	8									
VTB Left	706 ± 172	486 - 907	4	t (5.5) = -1.1, p = 0.32	0.43 ± 0.11	0.32 - 0.57	4	t (5.5) = 0.07, p = 0.95	641 ± 197	357 - 794	4	t (5.9) = 0.98, p = 0.37					6.77 ± 1.03	5.83 - 8.41	4	t (4.98) = -1.5, p = 0.18
VTB Right	824 ± 128	686 - 994	4		0.43 ± 0.15	0.22 - 0.56	4		514 ± 170	314 - 681	4						7.89 ± 0.65	7.02 - 8.59	3	
Sides Pooled	765 ± 154	486 - 994	8		0.43 ± 0.12	0.22 - 0.57	8		577 ± 183	314 - 794	8						7.25 ± 1.13	5.83 - 8.59	7	
DTB Left	382 ± 62	291 - 427	4	t (5.6) = -2.1, p = 0.08	0.31 ± 0.1	0.18 - 0.42	4	t (6) = -0.07, p = 0.95	808 ± 177	608 - 1039	4	t (5.8) = 0.9, p = 0.4								
DTB Right	462 ± 46	433 - 531	4		0.32 ± 0.12	0.19 - 0.42	4		685 ± 211	423 - 928	4									
Sides Pooled	422 ± 66	291 - 531	8		0.32 ± 0.1	0.18 - 0.42	8		747 ± 192	423 - 1039	8									

**Table S1. Syringeal muscle and NXIIIs nerve properties in the adult male zebra finch related to Figure 1E, 1F.**

Individual	Linear Fit $y = a + bx$		Exponential Fit $y = Ae^{Bx}$		$x_0$	
	a	b	A	B	(mN)	% of VS max
1	0.0	5.0	8.4	0.22	4.57	86
2	-29.0	27.1	16.0	0.42	3.42	64
3	2.2	25.3	55.4	0.17	5.78	>100
4	0.1	57.6	114.0	0.19	5.38	>100
5	-16.3	17.8	46.4	0.13	8.80	>100
mean $\pm$ SD	-8.6 $\pm$ 13.6	26.6 $\pm$ 19.4	48.0 $\pm$ 41.8	0.23 $\pm$ 0.12	5.6 $\pm$ 2.0	

**Table S2. Linear and exponential model fit parameters of force- $f_0$  transformation related to Figure 5C.** The fitted function was of the form:  $\begin{cases} a + bx, x \leq x_0 \\ Ae^{Bx}, x > x_0 \end{cases}$ .