

## Supplemental Materials

Condition		subdiffusive ( $\alpha_n < 1$ )			superdiffusive ( $\alpha_n > 1$ )			N	mean $R_{\text{PRW}}^2$	all	
		n (%)	mean $R_{\text{AD}}^2$	mean $R_{\text{PRW}}^2$	n (%)	mean $R_{\text{AD}}^2$	mean $R_{\text{PRW}}^2$			mean $\alpha_n$	mean $R_{\text{AD}}^2$
Bone	normal	14 (16%)	0.90	0.34	73 (84%)	0.99	0.98	87	0.87	1.32	0.98
	+anti- $\beta$ 1	40 (31%)	0.94	0.53	91 (69%)	0.99	0.97	131	0.83	1.14	0.97
	+EGF	65 (28%)	0.91	0.23	164 (72%)	0.99	0.98	229	0.76	1.28	0.97
Brain	normal	42 (47%)	0.88	-0.19	48 (53%)	0.99	0.98	90	0.44	0.99	0.94
	+anti- $\beta$ 1	161 (72%)	0.85	-0.74	62 (28%)	0.99	0.97	223	-0.26	0.74	0.89
	+EGF	79 (36%)	0.86	-0.49	141 (64%)	0.99	0.98	220	0.45	1.14	0.94
Lung	normal	25 (30%)	0.89	-0.01	58 (70%)	0.99	0.98	83	0.68	1.20	0.96
	+anti- $\beta$ 1	107 (54%)	0.83	-1.22	92 (46%)	0.99	0.97	199	-0.21	0.91	0.90
	+EGF	17 (18%)	0.89	0.50	78 (82%)	0.99	0.97	95	0.89	1.32	0.97
Figure 2 total		550 (41%)	0.87	-0.45	807 (59%)	0.99	0.97	1357	0.40	1.08	0.94
RGD	0.1	0 (0%)			169 (100%)	1.00	0.99	169	0.99	1.71	1.00
	1	0 (0%)			188 (100%)	1.00	0.99	188	0.99	1.71	1.00
	2.5	0 (0%)			136 (100%)	1.00	0.99	136	0.99	1.74	1.00
	5	0 (0%)			116 (100%)	1.00	0.99	116	0.99	1.74	1.00
Fibronectin	0.1	0 (0%)			53 (100%)	1.00	0.99	53	0.99	1.71	1.00
	1	1 (1%)	0.97	0.81	138 (99%)	1.00	0.99	139	0.99	1.66	1.00
	2.5	0 (0%)			129 (100%)	1.00	0.99	129	0.99	1.69	1.00
	5	0 (0%)			114 (100%)	1.00	0.99	114	0.99	1.69	1.00
	10	1 (1%)	0.80	0.11	114 (99%)	1.00	0.99	115	0.98	1.67	1.00
Figure 3 total		2 (0%)	0.89	0.46	1157 (100%)	1.00	0.99	1159	0.99	1.70	1.00
2D gels	1	8 (20%)	0.88	0.45	33 (80%)	0.98	0.95	41	0.85	1.32	0.96
	4	8 (17%)	0.78	0.01	40 (83%)	0.99	0.95	48	0.79	1.34	0.95
	10	9 (19%)	0.76	-0.06	39 (81%)	0.99	0.96	48	0.77	1.32	0.95
	18	5 (11%)	0.93	0.74	39 (89%)	0.98	0.95	44	0.93	1.35	0.98
	50	6 (25%)	0.83	0.26	18 (75%)	0.98	0.95	24	0.78	1.29	0.95
	64	4 (8%)	0.71	-0.55	44 (92%)	0.99	0.98	48	0.85	1.43	0.97
Figure 4 total		40 (16%)	0.81	0.15	213 (84%)	0.99	0.96	253	0.83	1.35	0.96
3D gels condition ed media	(none)	120 (74%)	0.83	-0.95	43 (26%)	0.97	0.95	163	-0.45	0.72	0.87
	HTERT	114 (55%)	0.87	0.27	92 (45%)	0.98	0.95	206	0.58	0.96	0.92
	Patient 1	49 (43%)	0.87	-0.45	64 (57%)	0.98	0.96	113	0.35	1.04	0.93
	Patient 2	37 (43%)	0.88	0.24	49 (57%)	0.97	0.94	86	0.64	1.04	0.94
	Patient 3	64 (60%)	0.89	0.02	42 (40%)	0.98	0.96	106	0.39	0.93	0.93
Figure 5 total		384 (57%)	0.86	-0.25	290 (43%)	0.98	0.96	674	0.27	0.92	0.91

**Supplemental Table 1.** Summary of individual cell regressions for AD and PRW models grouped by individual  $\alpha$  according to AD model.

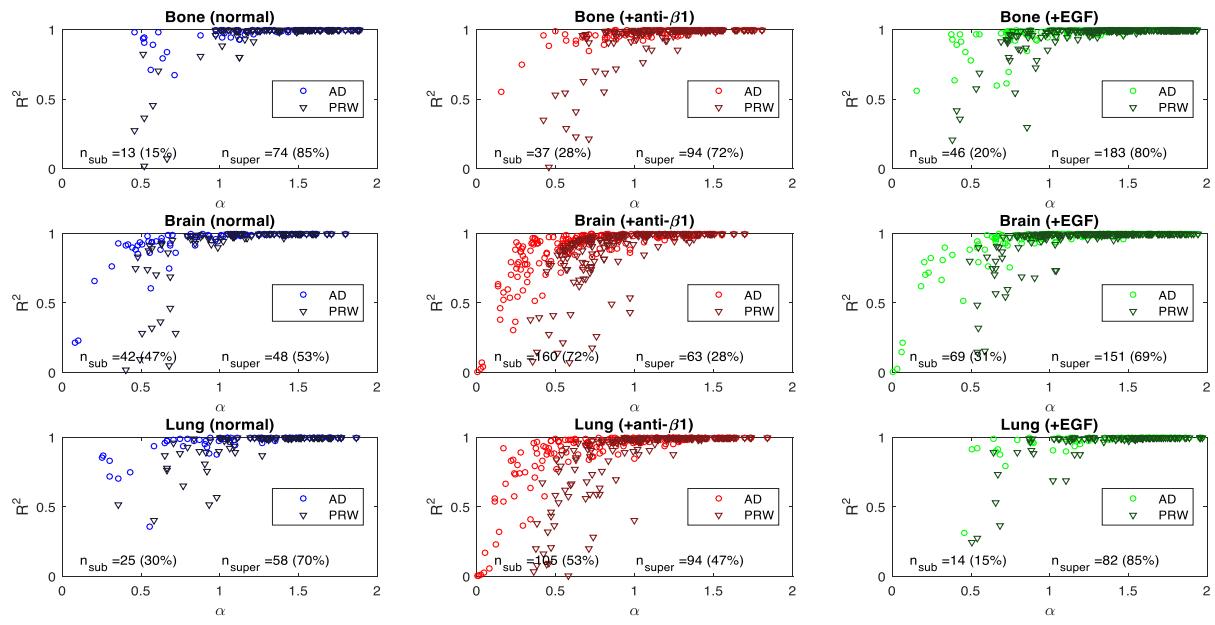
PRW fittings

Condition		<i>n</i>	Average <i>S</i>	Average <i>P<sub>n</sub></i> (hr) from <i>P<sub>n</sub></i> -only fitting	Average <i>R<sub>PRW</sub><sup>2</sup></i> for <i>P</i> -only (1-parameter) fitting	Average <i>S<sub>n</sub></i> ( $\mu\text{m}/\text{hr}$ ) from 2-parameter fitting	Average <i>P<sub>n</sub></i> from 2-parameter fitting	Average <i>R<sub>PRW</sub><sup>2</sup></i> for 2-parameter fitting	Aggregate <i>R<sub>PRW</sub><sup>2</sup></i>
Bone	normal	87	15.2	0.57	0.87	30.4	1.49	0.89	1.00
	+anti- $\beta$ 1	131	12.5	0.29	0.83	31.8	0.62	0.85	1.00
	+EGF	229	14.5	0.70	0.76	24.5	2.11	0.78	0.99
Brain	normal	90	15.7	0.25	0.44	36.5	0.48	0.46	1.00
	+anti- $\beta$ 1	223	12.2	0.12	-0.26	36.9	0.26	-0.23	1.00
	+EGF	220	17.3	0.46	0.45	27.8	1.16	0.47	0.99
Lung	normal	83	15.5	0.43	0.68	36.1	0.90	0.7	1.00
	+anti- $\beta$ 1	199	13.1	0.19	-0.21	32.7	0.59	-0.18	1.00
	+EGF	95	21.9	0.76	0.89	41.1	1.62	0.9	0.99
Figure 2 overall		1357	14.9	0.40	0.40	0.40	1.03	0.42	
RGD	0.1	169	50.5	1.42	0.99	45.2	3.90	1.00	0.99
	1	188	53.8	1.53	0.99	51.9	3.90	1.00	1.00
	2.5	136	55.4	1.71	0.99	51.9	4.21	1.00	1.00
	5	116	58.2	1.68	0.99	52.2	4.62	1.00	0.99
Fibronectin	0.1	53	48.5	1.44	0.99	43.2	4.12	1.00	0.99
	1	139	55.6	1.24	0.99	55.7	3.33	1.00	1.00
	2.5	129	60.1	1.37	0.99	62.7	3.61	1.00	1.00
	5	114	64.5	1.33	0.99	58.5	3.15	1.00	1.00
	10	115	67.1	1.30	0.98	61.4	3.36	0.99	0.99
Figure 3 overall		1159	57.0	1.45	0.99	0.99	3.79	1.00	
2D gels	1	41	26.8	0.51	0.85	76.9	0.84	0.87	1.00
	4	48	32.2	0.56	0.79	87.2	1.20	0.82	1.00
	10	48	35.0	0.53	0.77	92.1	1.31	0.79	1.00
	18	44	38.2	0.54	0.93	97.0	0.86	0.94	1.00
	50	24	28.5	0.52	0.78	86.9	0.77	0.81	1.00
	64	48	25.6	0.70	0.85	44.3	1.41	0.87	1.00
Figure 4 overall		253	31.3	0.57	0.83	0.83	1.10	0.85	
3D gels conditioned media	(none)	163	8.3	0.09	-0.45	24.6	0.62	-0.41	0.99
	HTERT	206	9.7	0.17	0.58	20.8	1.17	0.61	0.97
	Patient 1	113	10.3	0.25	0.35	23.2	1.16	0.38	0.98
	Patient 2	86	8.0	0.21	0.64	17.4	1.60	0.68	0.95
	Patient 3	106	12.0	0.21	0.39	32.9	0.84	0.42	0.99
Figure 5 overall		674	9.6	0.17	0.27	0.27	1.04	0.30	

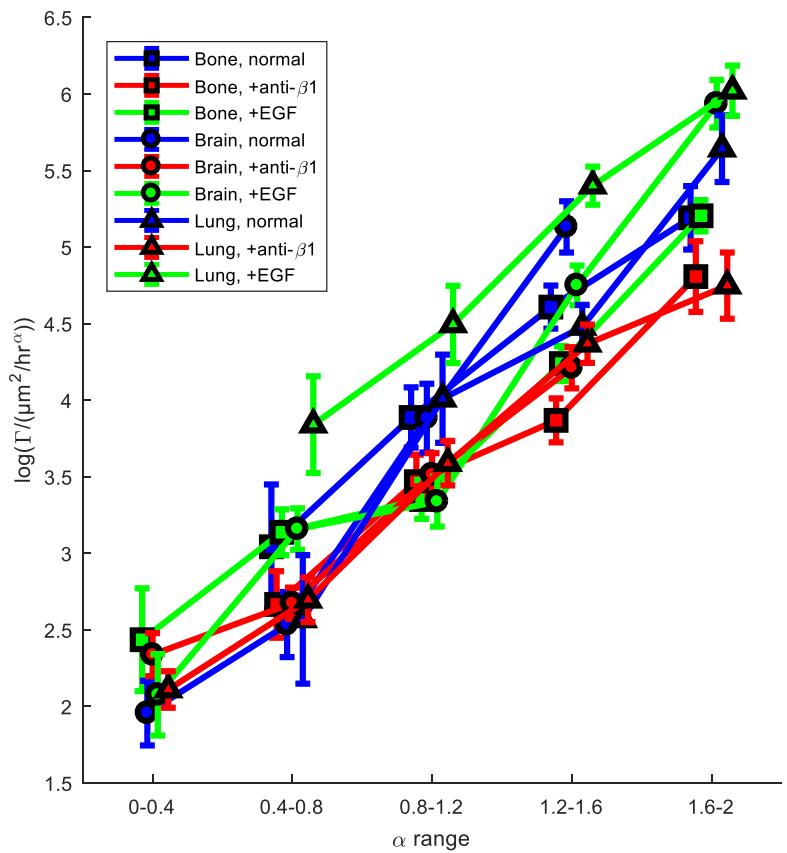
**Supplemental Table 2.** Aggregate and individual cell regressions for AD and PRW models obtained by fitting the model equations to the aggregate (average) of all cells in each condition or to the individual MSD data.

			AD aggregate MSD fittings		
Condition		n	Aggregate $\alpha$	Aggregate $\Gamma$ ( $\mu\text{m}^2/\text{hr}^\alpha$ )	aggregate $R^2_{\text{AD}}$
Bone	normal	87	1.53	149.4	1.00
	+anti- $\beta 1$	131	1.30	83.3	1.00
	+EGF	229	1.58	131.5	1.00
Brain	normal	90	1.38	139.6	1.00
	+anti- $\beta 1$	223	1.02	43.2	1.00
	+EGF	220	1.53	192.2	1.00
Lung	normal	83	1.47	160.2	1.00
	+anti- $\beta 1$	199	1.22	66.9	1.00
	+EGF	95	1.56	304.7	1.00
RGD	0.1	169	1.74	1812.4	1.00
	1	188	1.73	2115.0	1.00
	2.5	136	1.76	2299.3	1.00
	5	116	1.76	2469.5	1.00
Fibronectin	0.1	53	1.74	1667.4	1.00
	1	139	1.71	2158.1	1.00
	2.5	129	1.72	2568.7	1.00
	5	114	1.72	2987.5	1.00
	10	115	1.71	3117.3	1.00
2D gels	1	41	1.45	417.7	1.00
	4	48	1.43	593.3	1.00
	10	48	1.40	685.3	1.00
	18	44	1.41	807.3	1.00
	50	24	1.44	496.1	1.00
	64	48	1.57	433.7	1.00
3D gels conditioned media	(none)	163	0.84	13.6	0.97
	HTERT	206	1.11	24.1	0.98
	Patient 1	113	1.32	46.4	1.00
	Patient 2	86	1.21	17.7	0.98
	Patient 3	106	1.08	50.2	0.99

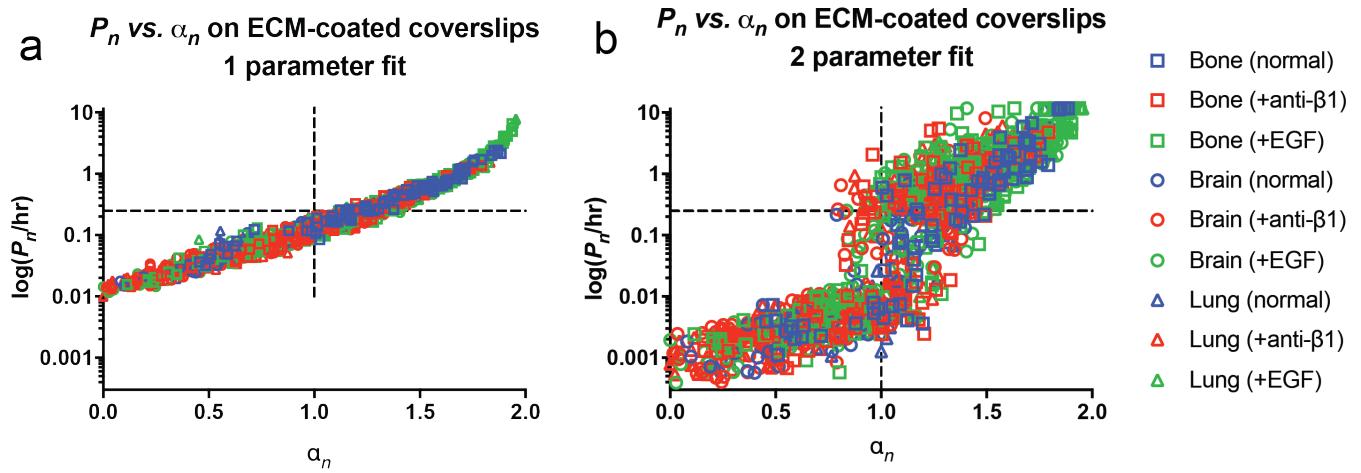
**Supplemental Table 3.** Aggregate cell regressions obtained by fitting the AD model equations to the aggregate (average) MSD data for all cells in each condition.



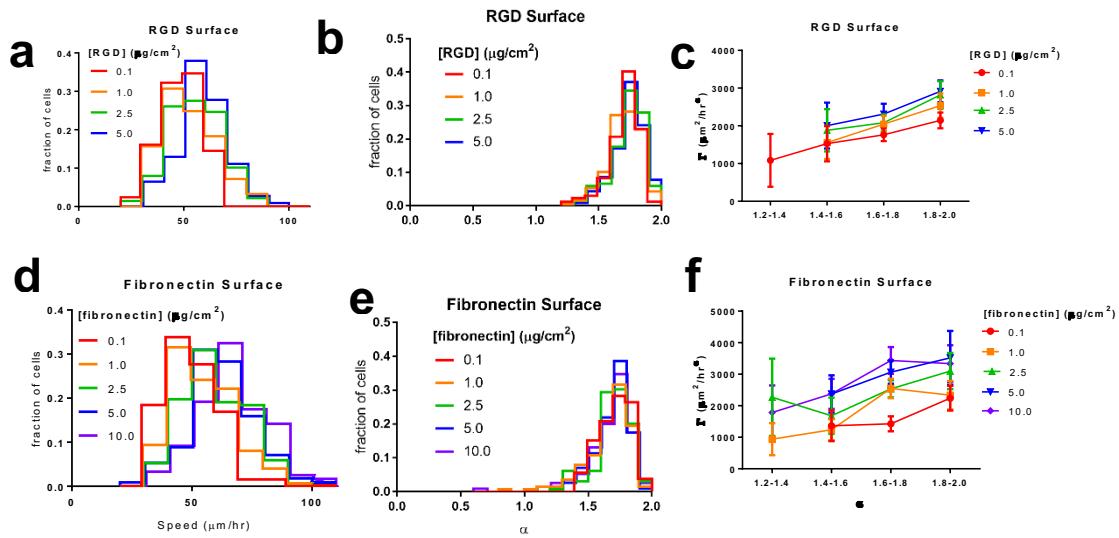
**Supplemental Figure 1.** Scatterplots of  $R^2_{PRW}$  and  $R^2_{AD}$  versus  $\alpha_n$  for the AD and PRW model for cells on ECM cocktail-coated coverslips.



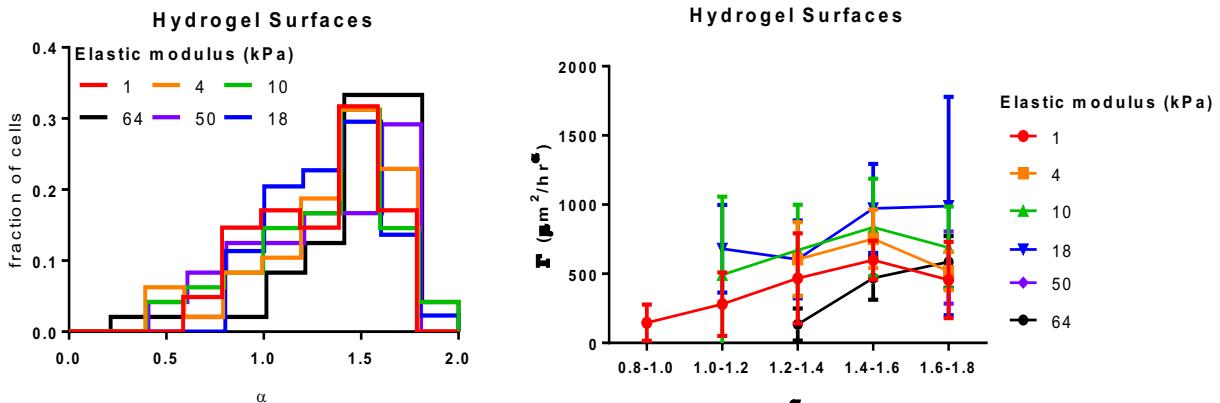
**Supplemental Figure 2.** Semilog of average  $\Gamma_n$  plots for all 9 ECM protein cocktail conditions (squares – bone; circles – brain; triangles – lungs; error bars show standard error of the mean) for groups of cells binned by  $\alpha_n$  values (condition bins containing fewer than 6 cells are not shown). Connecting lines are shown for visualization purposes only. The numerically increasing trend of  $\Gamma_n$  with  $\alpha_n$  is an artifact of the time interval used and method of fitting.



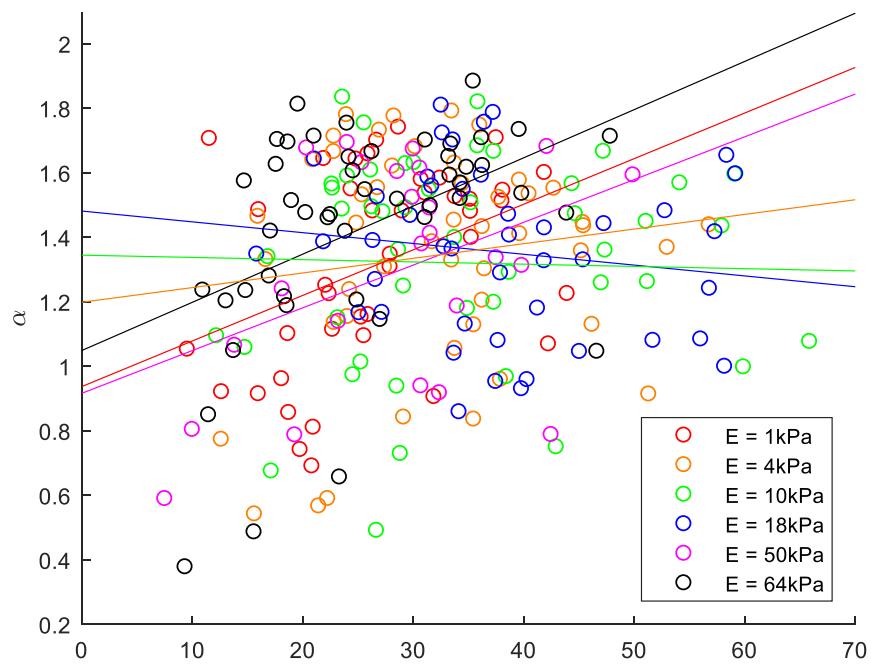
**Supplemental Figure 3.** (a) Scatterplot of  $P_n$  vs  $\alpha_n$  for cells on ECM cocktail-coated substrates when  $P_n$  is determined using the 1-parameter fit ( $S$  is fixed at its empirical value). (b) Scatterplot of  $P_n$  vs  $\alpha_n$  for cells on ECM cocktail-coated substrates when  $P_n$  is determined using the 2-parameter fit.



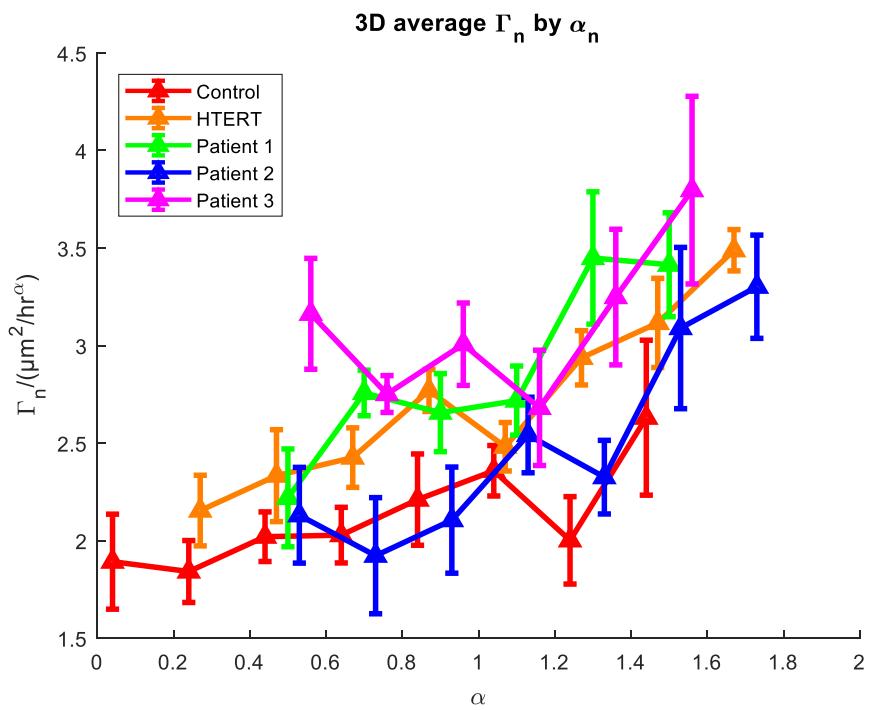
**Supplemental Figure 4.** Cell migration on surfaces functionalized with different concentrations of RGD or fibronectin. Histograms of individual cell speed and  $\alpha_n$  parameter are shown for RGD (a,b) and fibronectin (d,e) surfaces. Average  $\Gamma_n$  parameter of cells binned by  $\alpha_n$  are shown for RGD (c) and fibronectin (f) surfaces (bins with fewer than 6 cells are not shown). Error bars represent 95% confidence intervals.



**Supplemental Figure 5.** Histogram of individual cell  $\alpha_n$  parameter (a) for cells on substrates of varying stiffness are shown. Average numerical  $\Gamma_n$  parameter of cells binned by  $\alpha_n$  (b) (bins with fewer than 6 cells are not shown). Error bars represent 95% confidence intervals.



**Supplemental Figure 6.** Scatterplot for individual  $\alpha_n$  versus cell speed with simple linear regressions show that  $\alpha_n$  slightly increases with speed for low- and high-modulus surfaces but stays constant or slightly decreases for mid-modulus surfaces.



**Supplementary Figure 7.** The average numerical  $\Gamma$  parameter of cells, binned by  $\alpha$ , (bins with fewer than 6 cells are not shown) for cells in 3D hydrogels supplemented with growth medium (control), or conditioned medium from a mesenchymal stem cell line (hTERT) or patient-derived cells. Error bars represent 95% confidence intervals.