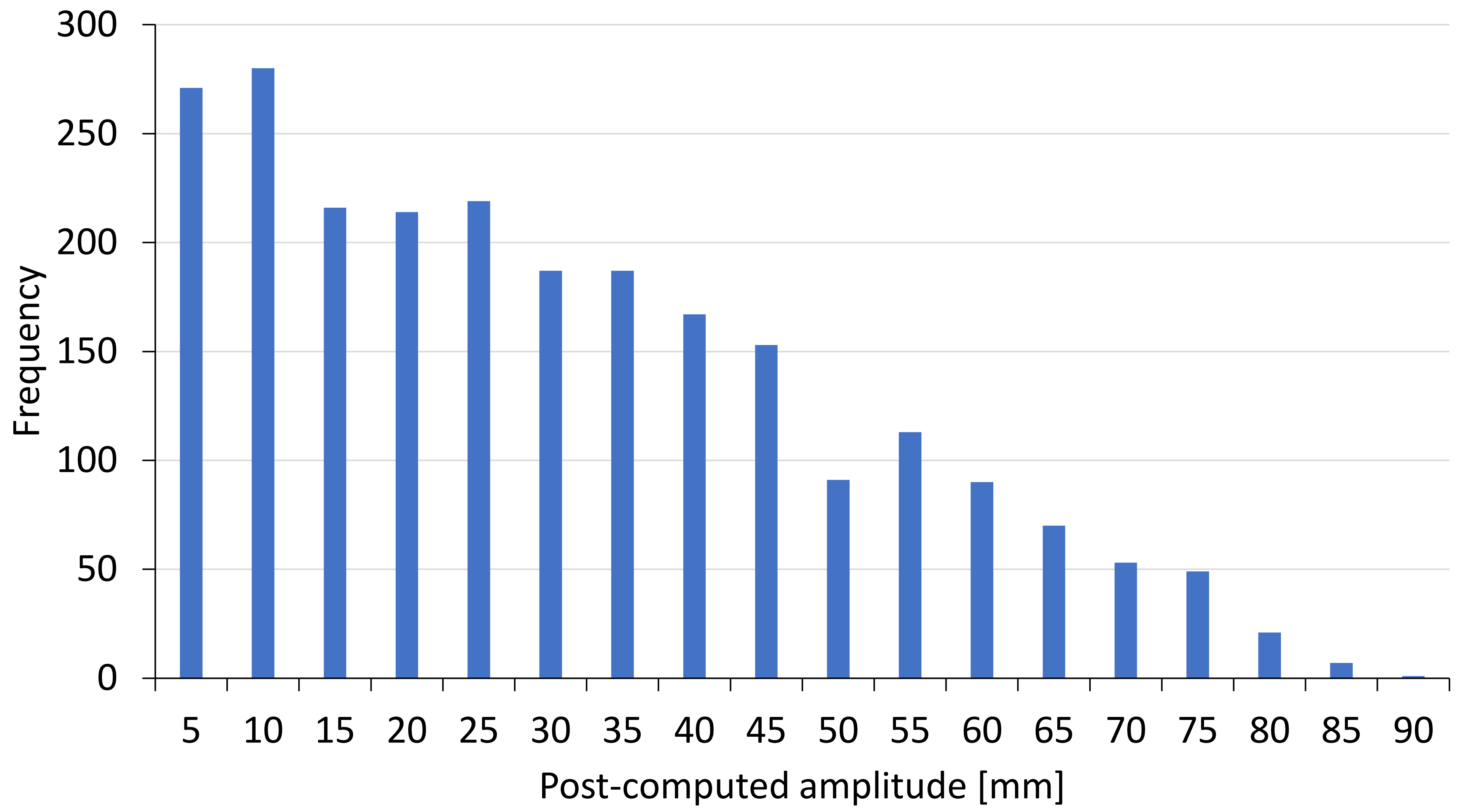
Experiment 1

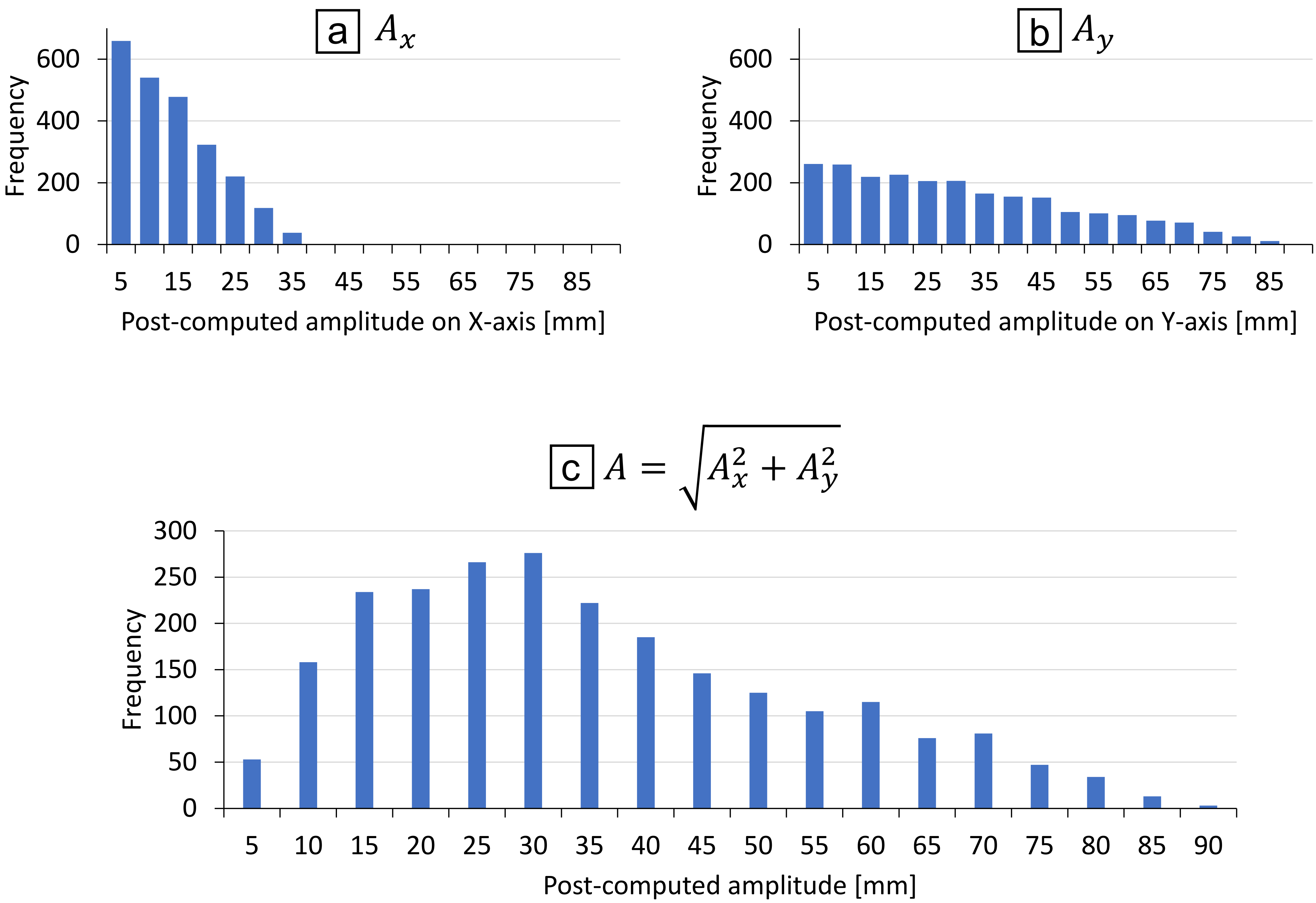
This histogram shows the frequency of movement amplitudes from the previous target to the current target in Experiment 1. For the first target, the distance is measured from the start bar.
The bar on (e.g.) "10 mm" shows the frequency of the movement amplitudes in the range [5, 10) mm.

This shows that there were various movement amplitudes. Because a long distance could be chosen when the previous target was close to the top or bottom edge of the screen, the chances that a longer *A* is chosen are lower.



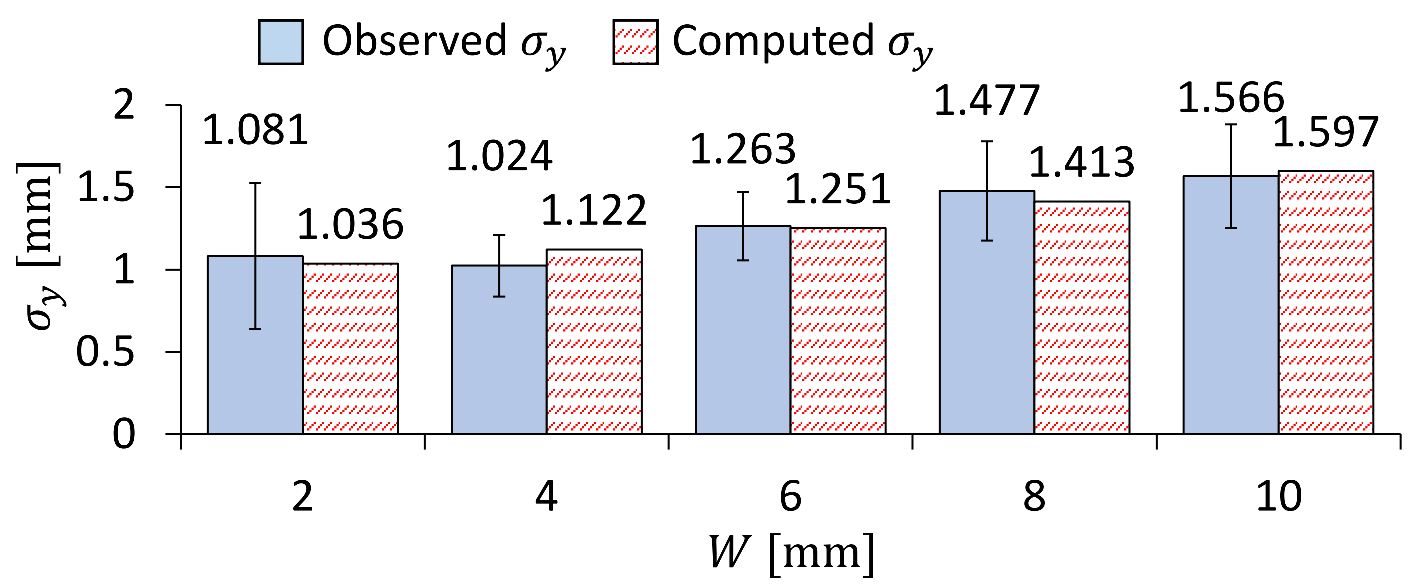
Experiment 3

These histograms show the frequencies of movement amplitudes from the previous target to the current target on the (a) x- and (b) y-axes, and (c) the distance in Experiment 3. For the first target, the distance is measured from the start circle.

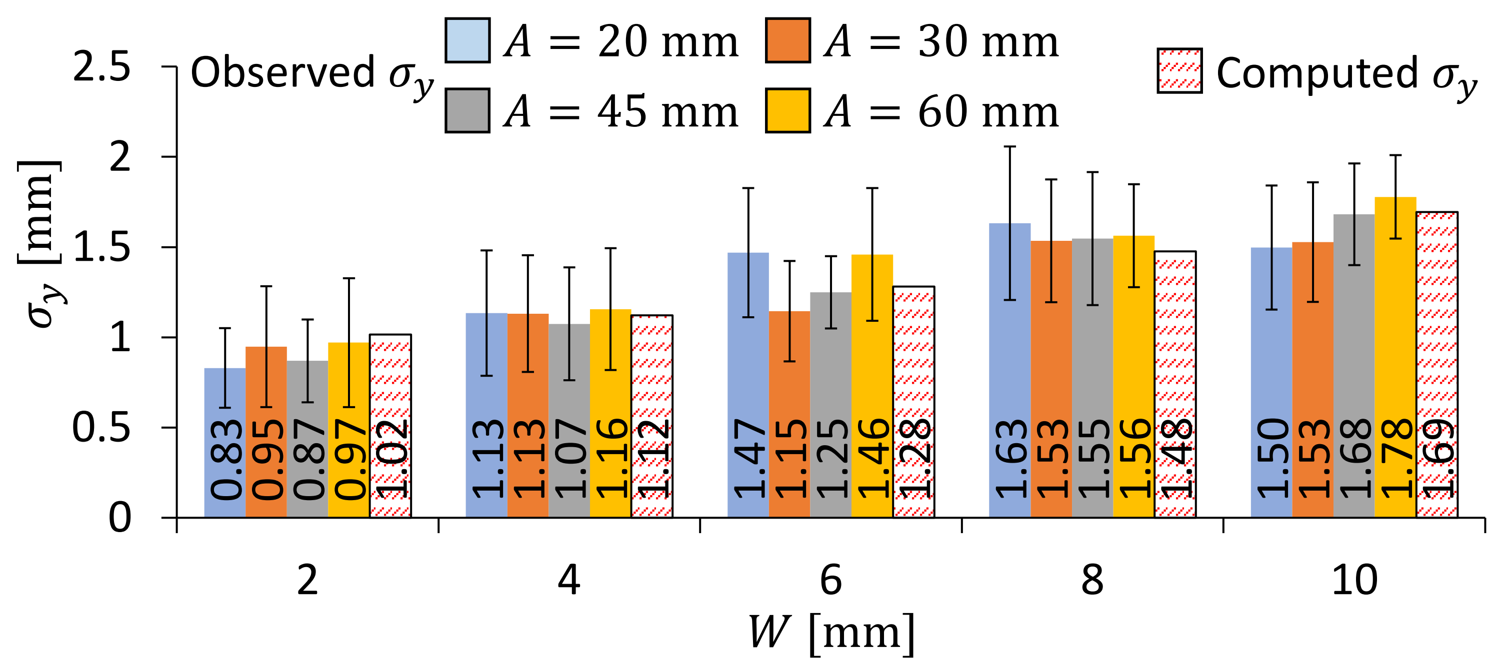


Experiments 1 and 2

Observed versus computed touch-point distributions in Experiment 1. This shows the details of the values in Figure 2.

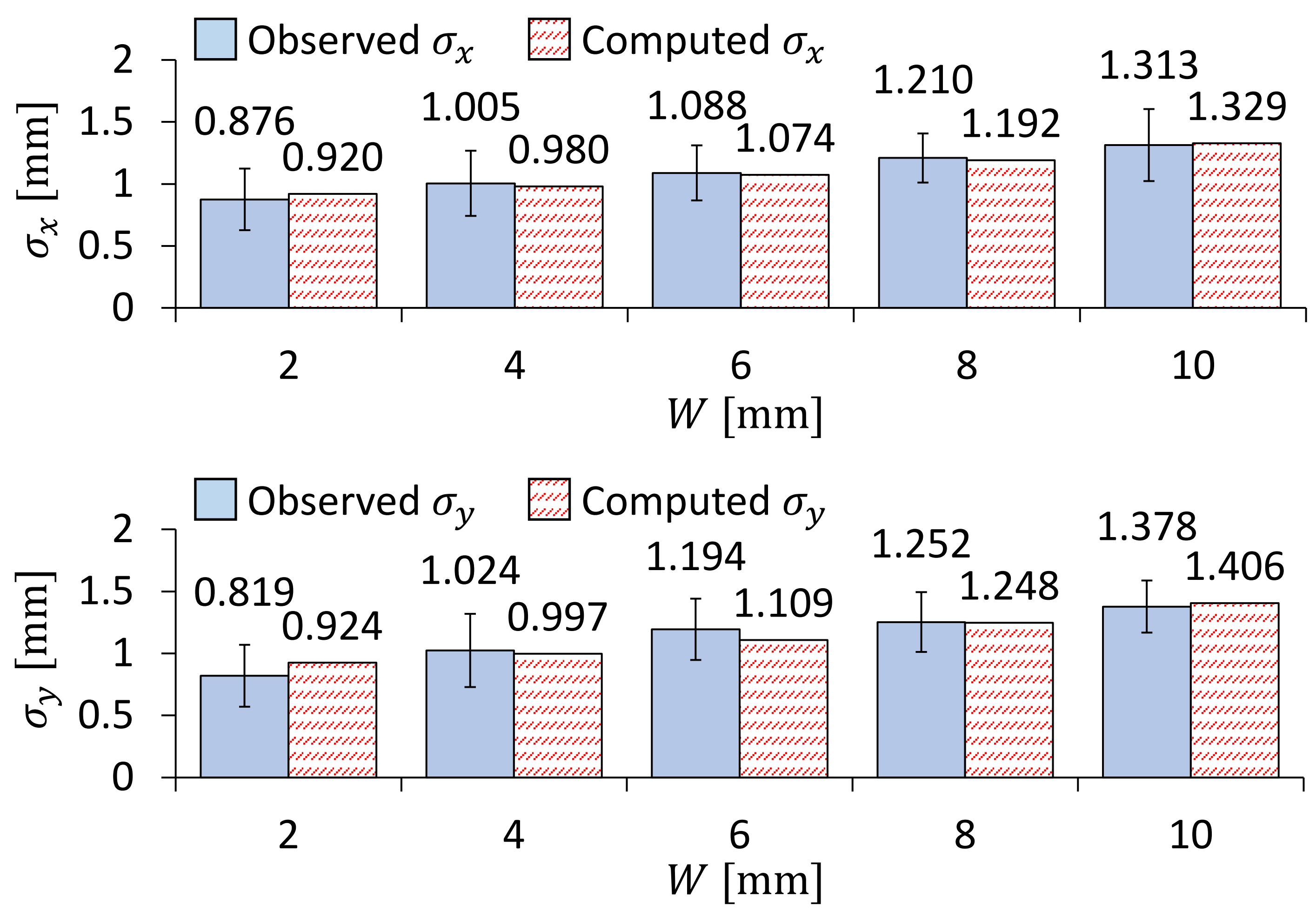


Observed versus computed touch-point distributions in Experiment 2. This shows the details of the values in Figure 4.

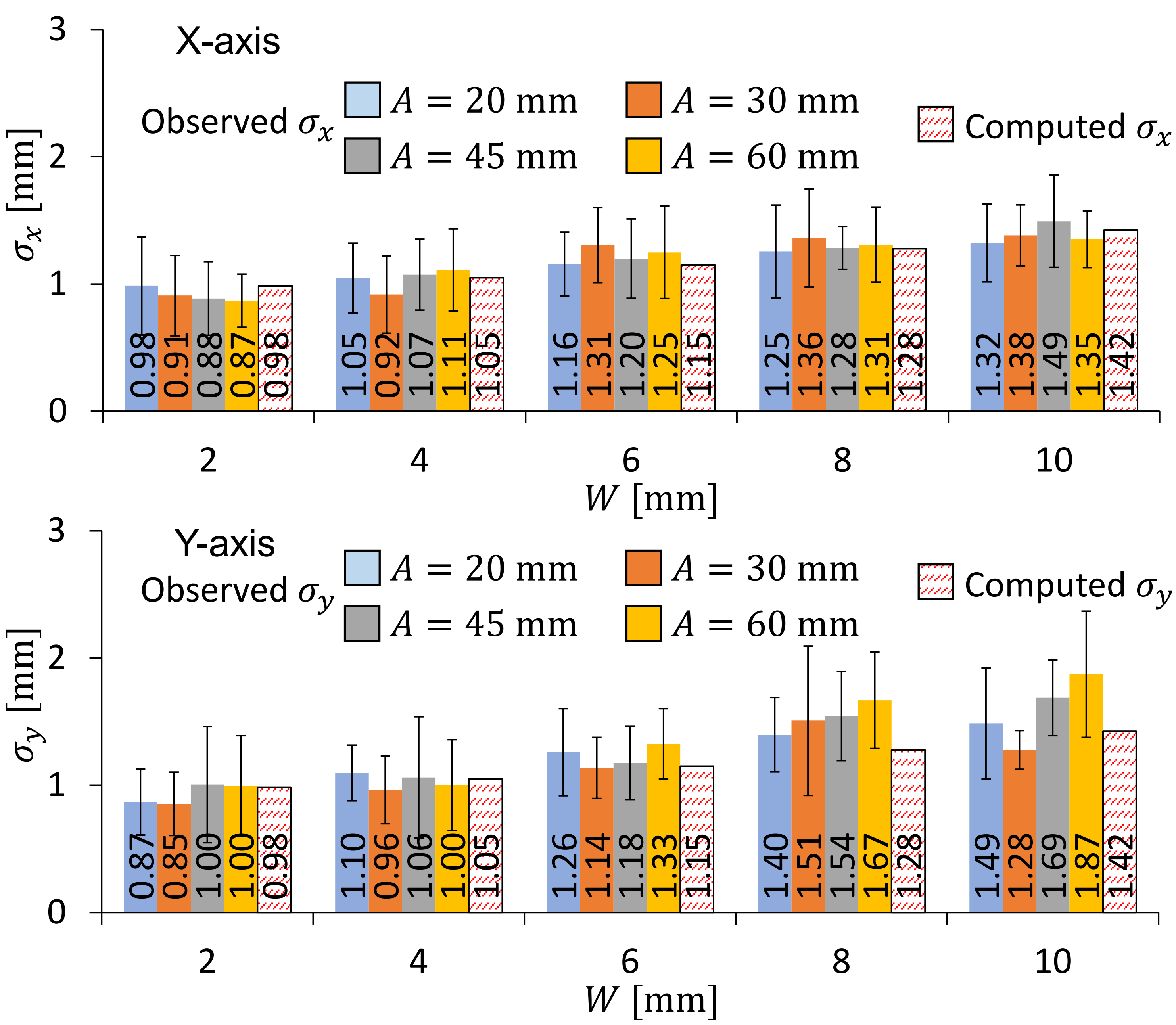


Experiments 3 and 4

Observed versus computed touch-point distributions in Experiment 3. This shows the details of the values in Figure 6.

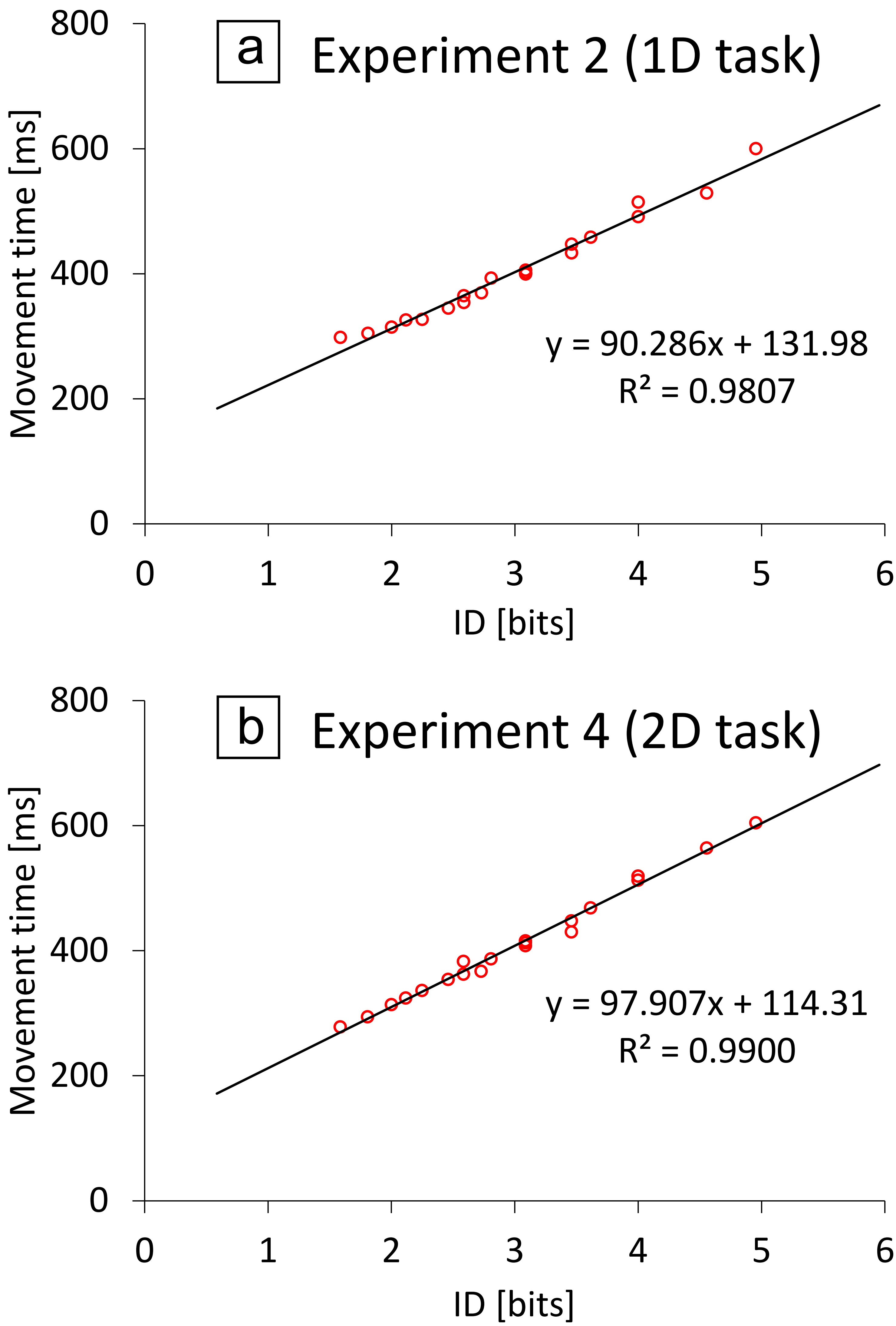


Observed versus computed touch-point distributions in Experiment 4. This shows the details of the values in Figure 8.



Experiments 2 and 4

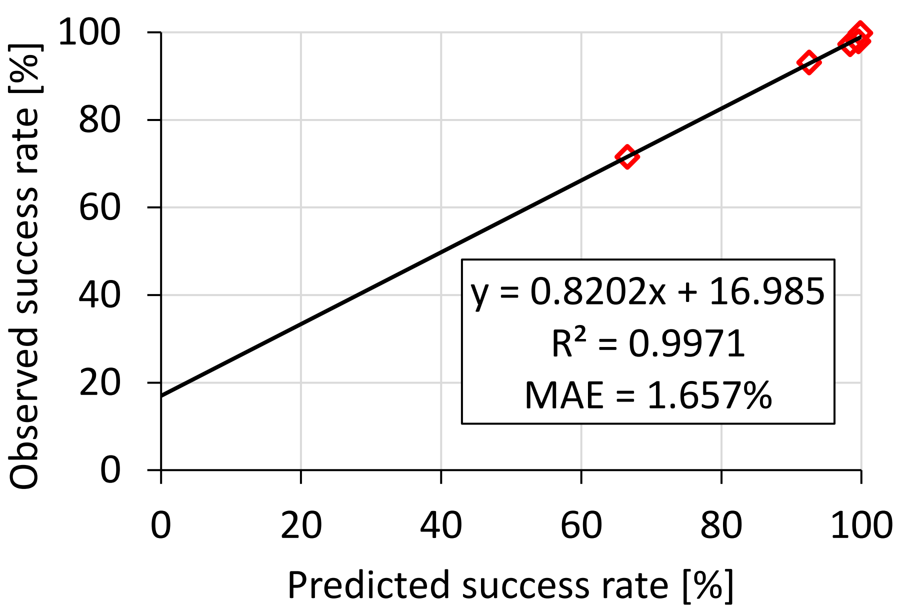
Fitts' law for the error-free data using nominal *A* and *W* values (*N* = 20 data points). $ID = \log_2\left(\frac{A}{W} + 1\right)$.



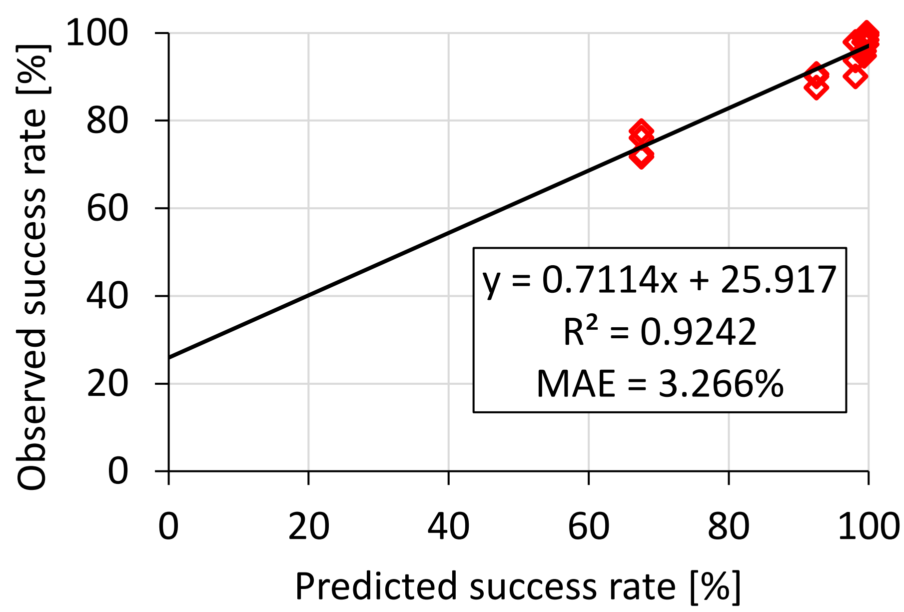
Experiments 1, 2, 3, and 4

Comparisons of predicted versus observed success rates. Below are other visualizations of Figures 3, 5, 7, and 9 in the main manuscript, which correspond to (a) – (d) below, using the same data.

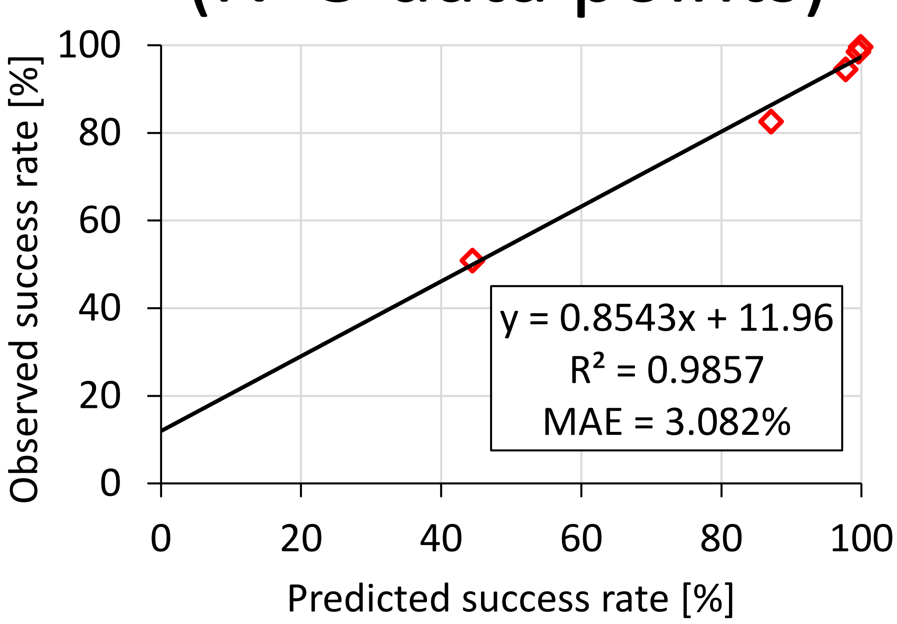
a Experiment 1 (N=5 data points)



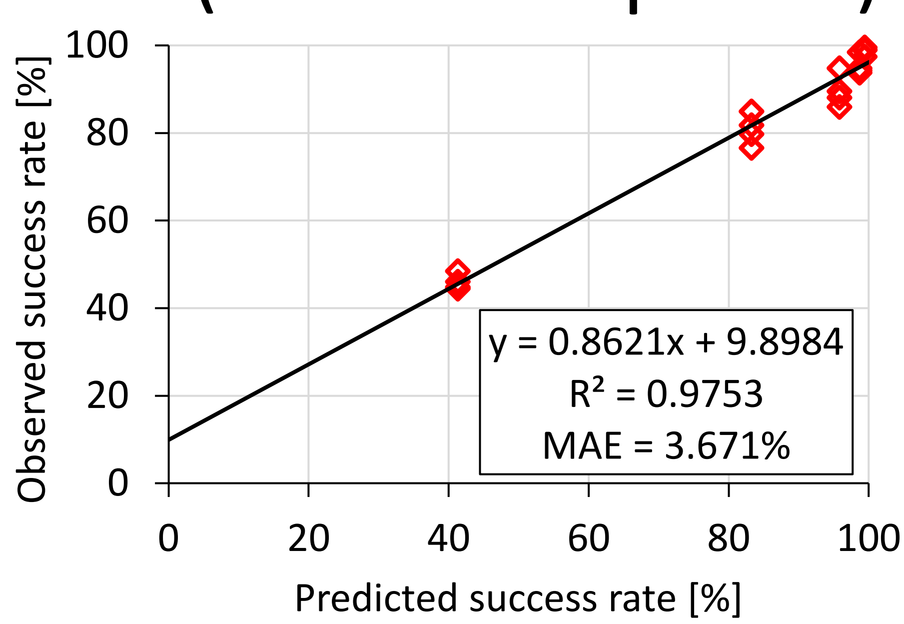
b Experiment 2 (N=20 data points)



c Experiment 3 (N=5 data points)



d Experiment 4 (N=20 data points)



Experiment 1

Shapiro-Wilk tests showed that touch points followed Gaussian distributions ($p > 0.05$) for 47 out of 60 conditions (78.3%), which are colored in pink below.

	W [mm]	2	4	6	8	10
participant #	0	0.0369	0.5713	0.7734	0.09101	0.5561
	1	0.1729	0.03726	0.3474	0.9826	0.3539
	2	0.003162	0.2691	0.7946	0.00243	0.3993
	3	0.1928	0.001101	0.4553	0.3348	0.1417
	4	0.8418	0.05514	0.575	0.2713	0.231
	5	0.04603	0.02242	0.2512	0.5583	0.6985
	6	0.04778	0.09478	0.01777	0.4398	0.000166
	7	0.1529	0.002061	0.5428	0.5683	0.9051
	8	4.73E-10	0.9431	0.1154	0.7853	0.396
	9	0.02199	0.4465	0.1868	0.09963	0.443
	10	0.8462	0.9075	0.2515	0.2637	0.4245
	11	0.05222	0.7023	0.684	0.7695	0.5446

Experiment 2

218/240 = 90.8% conditions showed Gaussian distributions.

	A [mm]	20	20	20	20	20	30	30	30	30	30	45	45	45	45	45	60	60	60	60	60
	W [mm]	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10
participant #	0	0.004409	0.3911	0.5282	0.9222	0.1779	0.03989	0.07516	0.1749	0.8041	0.6689	0.3693	0.7817	0.3856	0.5711	0.02951	0.000132	0.03804	0.5983	0.291	0.1674
	1	0.3124	0.06033	0.1749	0.01917	0.2324	0.5904	0.06448	0.2555	0.5007	0.01643	0.341	0.5631	0.3162	0.1807	0.5877	0.0124	0.8707	0.08274	0.1823	0.3925
	2	0.1659	0.9569	0.09121	0.2283	0.3629	0.3229	0.07357	0.6682	0.1784	0.1035	0.5958	0.9826	0.2653	0.8307	0.3513	0.8491	0.4099	0.4978	0.9741	0.8148
	3	0.03631	0.3074	0.4632	0.08456	0.05673	0.08956	0.3954	0.001527	0.06269	0.8059	0.7719	0.1386	0.6064	0.4279	0.1145	0.4024	0.2464	0.3239	0.1871	0.09775
	4	0.09896	0.0371	0.06806	0.2771	0.4466	0.4738	0.1424	0.2402	0.5144	0.0421	0.4948	0.1511	0.1135	0.5366	0.214	0.5259	0.5622	0.4286	0.5996	0.3479
	5	0.005491	0.6249	0.507	0.9235	0.7651	0.2357	0.02898	0.09563	0.876	0.1752	0.7163	0.7582	0.301	0.8011	0.4981	0.9306	0.004348	0.2042	0.9164	0.1146
	6	0.0406	0.5	0.9936	0.2052	0.483	0.01732	0.3967	0.5103	0.6363	0.4209	0.6399	0.4029	0.1739	0.208	0.206	0.1794	0.4324	0.2099	0.9989	0.3607
	7	0.8801	0.9497	0.006239	0.667	0.3985	0.485	0.2123	0.8783	0.6705	0.9969	0.09818	0.5438	0.9863	0.2115	0.2629	0.23	0.7324	0.4938	0.6904	0.1714
	8	0.06456	0.7879	0.1651	0.008724	0.5271	0.2707	0.396	0.3112	0.6411	0.1705	0.306	0.3905	0.2594	0.2193	0.8246	0.6137	0.3478	0.3798	0.3816	0.954
	9	0.7215	0.8386	0.8416	0.3175	0.1239	0.5493	0.01598	0.2661	0.1621	0.8206	0.3369	0.9672	0.5524	0.3198	0.1305	0.3246	0.2222	0.9132	0.729	0.3207
	10	0.7898	0.2309	0.7741	0.4845	0.4242	0.6569	0.7484	0.6294	0.8624	0.4724	0.6126	0.9863	0.6812	0.6671	0.4276	0.9213	0.05882	0.1364	0.5127	0.5473
	11	0.9713	0.6909	0.7601	0.3769	0.8728	0.6251	0.07534	0.2958	0.141	0.6968	0.4128	0.01602	0.3605	0.7293	0.4172	0.9199	0.4985	0.01766	0.2565	0.2113

Experiment 3

55/60 = 91.7% and 53/60 = 88.3% conditions on the x- and y-axes showed univariate Gaussian distributions, respectively.
41/60 = 68.3% conditions showed bivariate Gaussian distributions.

X

	W [mm]	2	4	6	8	10
participant #	0	0.4659	0.03937	0.321	0.2411	0.6362
	1	0.5898	0.2839	0.3264	0.08846	0.08511
	2	0.5305	0.7286	0.7842	0.05099	0.1581
	3	0.1922	0.4175	0.3316	0.6425	0.9089
	4	0.2401	0.1586	0.1183	0.05898	0.352
	5	0.19	0.5752	0.5346	0.566	0.9913
	6	0.001192	0.4497	0.6768	0.2273	0.7967
	7	0.6031	0.3999	0.09942	0.6763	0.5735
	8	0.04055	0.3071	0.1092	0.4667	0.9577
	9	0.2575	0.4846	0.3091	0.01026	0.2425
	10	0.1331	0.5913	0.9909	0.6931	0.1268
	11	0.1489	0.1776	0.7672	0.6338	0.04751

Y

	W [mm]	2	4	6	8	10
participant #	0	0.06788	0.5732	0.5253	0.5331	0.002276
	1	0.5662	0.7947	0.5165	0.6332	0.09184
	2	0.1713	0.6957	0.6262	0.8027	0.2746
	3	0.04669	0.1349	0.8075	0.7422	0.3968
	4	0.1183	0.1099	0.8785	0.5536	0.4124
	5	2.08E-06	0.4939	0.8763	0.7067	0.4998
	6	0.1936	0.2001	0.0787	0.4755	0.527
	7	0.7353	0.3266	0.7125	0.3351	0.1513
	8	0.001056	0.03951	0.2551	0.04479	0.09434
	9	0.0842	0.003302	0.9897	0.3634	0.9929
	10	0.3343	0.2756	0.2005	0.4314	0.7026
	11	0.2878	0.2413	0.5155	0.599	0.1494

Bivariate

	W [mm]	2	4	6	8	10
participant #	0	0.324	0.04615	0.5364	0.214	0.000421
	1	0.643	0.3305	0.2412	0.1069	0.01886
	2	0.5485	0.4728	0.6926	0.04724	0.255
	3	0.008695	0.03729	0.3359	0.3148	0.4002
	4	0.08463	0.006597	0.9537	0.5932	0.1979
	5	2.08E-06	0.01812	0.6443	0.2457	0.04722
	6	0.001297	0.2253	0.03348	0.6429	0.304
	7	0.8388	0.5876	0.2248	0.1897	0.488
	8	0.000502	0.04146	0.02746	0.6849	0.7982
	9	0.06873	0.001592	0.9865	0.375	0.7137
	10	0.0324	0.09865	0.5768	0.4192	0.7221
	11	0.02858	0.6687	0.4039	0.7139	0.01234

Experiment 4

224/240 = 94.4% and 218/240 = 90.8% conditions on the x- and y-axes showed univariate Gaussian distributions, respectively.
184/240 = 76.7% conditions showed bivariate Gaussian distributions.

X

	A [mm]	20	20	20	20	20	30	30	30	30	30	45	45	45	45	45	60	60	60	60	60
	W [mm]	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10
participant #	0	0.2421	0.1242	0.2903	0.4117	0.2222	0.9143	0.5294	0.9513	0.2666	0.6258	0.377	0.6777	0.7948	0.7128	0.3858	0.7747	0.09389	0.7959	0.2502	0.9237
	1	0.9242	0.5165	0.2143	0.867	0.6184	0.6143	0.5392	0.7577	0.2873	0.07934	0.984	0.1818	0.05312	0.8331	0.8538	0.9077	0.5584	0.9035	0.6131	0.02059
	2	0.6149	0.5691	0.2146	0.4358	0.8679	0.753	0.4946	0.2714	0.5413	0.956	0.07583	0.03412	0.2949	0.5947	0.3134	0.3277	0.1285	0.349	0.7892	0.2803
	3	0.9874	0.9053	0.3728	0.7585	0.05047	0.5053	0.9818	0.9798	0.4741	0.7899	0.5631	0.1036	0.3879	0.2261	0.4844	0.8386	0.3289	0.1874	0.9309	0.2143
	4	0.5553	0.02145	0.006476	0.5212	0.5445	0.6147	0.9922	0.8638	0.00298	0.4843	0.1277	0.9463	0.3664	0.08218	0.3001	0.8844	0.6336	0.1958	0.5625	0.7609
	5	0.3054	0.3599	0.5916	0.2677	0.3968	0.01161	0.5845	0.3942	0.2401	0.7713	0.7026	0.365	0.8501	0.2317	0.1463	0.01692	0.5829	0.3759	0.6536	0.7174
	6	0.2824	0.1108	0.01366	0.01616	0.5571	0.2176	0.8775	0.6922	0.4518	0.1993	0.2848	0.7886	0.2412	0.3195	0.5839	0.2132	0.4741	0.4021	0.5155	0.2557
	7	0.281	0.855	0.2969	0.5521	0.2873	0.7808	0.07642	0.1031	0.2297	0.7497	0.999	0.8296	0.9952	0.8579	0.6607	0.05745	0.8153	0.7709	0.3511	0.8431
	8	0.4334	0.4008	0.2251	0.9846	0.4391	0.07475	0.7282	0.5757	0.5487	0.03886	0.000119	0.779	0.6327	0.3324	0.5701	0.05329	0.1582	0.5338	0.2234	0.00139
	9	0.5803	0.5219	0.1432	0.1644	0.8925	0.9603	0.2807	0.1814	0.5877	0.2974	0.09163	0.5331	0.7644	0.07246	0.02775	0.9063	0.1038	0.9984	0.443	0.154
	10	0.306	0.4375	0.9532	0.6114	0.7698	0.2909	0.9694	0.835	0.6334	0.3282	0.7271	0.4501	0.7734	0.02775	0.7521	0.3074	0.9156	0.5014	0.9989	0.05113
	11	0.2079	0.9401	0.07591	0.004507	0.8372	0.7245	0.3517	0.6334	0.5302	0.9331	0.008777	0.3589	0.8499	0.0609	0.2039	0.8432	0.8863	0.08118	0.1964	0.181

Y

	A [mm]	20	20	20	20	20	30	30	30	30	30	45	45	45	45	45	60	60	60	60	60
	W [mm]	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10
participant #	0	0.8532	0.5033	0.3358	0.2038	0.09178	0.7611	0.00094	0.5137	0.7222	0.2158	0.7383	0.81	0.8911	0.08688	0.7635	0.9239	0.145	0.8585	0.3118	0.4675
	1	0.4581	0.6111	0.3164	0.4942	0.9502	0.3919	0.07017	0.1745	0.3061	0.8965	0.02528	0.3918	0.2241	0.9286	0.04288	0.3719	0.9114	0.7997	0.06756	0.9208
	2	0.2918	0.5038	0.9015	0.4067	0.1282	0.2289	0.3687	0.2354	0.2688	0.4788	0.7385	0.01027	0.6477	0.8318	0.09164	0.9874	0.06739	0.1417	0.9426	0.9778
	3	0.1463	0.4858	0.2971	0.6333	0.7379	0.6879	0.467	0.3216	0.5412	0.05587	0.4674	0.9226	0.1312	0.8714	0.7462	0.6536	0.01324	0.03629	0.9032	0.4102
	4	0.1421	0.9053	0.2983	0.3695	0.09584	0.5246	0.4233	0.1852	0.00014	0.1411	0.5898	0.6015	0.4623	0.5519	0.8442	0.06952	0.08643	0.248	0.641	0.3799
	5	0.03983	0.281	0.7827	0.5703	0.8947	0.005549	0.55	0.2537	0.5431	0.9229	0.3422	0.1139	0.9543	0.02762	0.2816	0.9634	0.3517	0.5094	0.5031	0.1224
	6	0.7898	0.09701	0.2204	0.58	0.7655	0.2021	0.5549	0.7156	0.4532	0.1205	0.3681	0.9979	0.5661	0.4103	0.803	0.5689	0.06113	0.9399	0.6615	0.8634
	7	0.854	0.716	0.4925	0.002999	0.5803	0.0162	0.2822	0.2636	0.5851	0.02504	0.03939	0.9273	0.2489	0.6553	0.7134	0.5289	0.5067	0.001577	0.787	0.1515
	8	0.6867	0.5059	0.226	0.6545	0.3629	0.5405	0.307	0.8479	0.7512	0.6562	0.01251	0.8272	0.5026	0.2997	0.7616	0.421	0.3232	0.622	0.04983	0.4516
	9	0.4763	0.01275	0.1553	0.07526	0.1588	0.3202	0.1427	0.1603	0.8812	0.1516	0.9468	0.415	0.5479	0.72	0.6295	0.842	0.4796	0.9737	0.9864	0.9209
	10	0.2158	0.3982	0.7246	0.953	0.05317	0.999	0.9544	0.02244	0.04607	0.007109	0.3459	0.635	0.3209	0.679	0.3967	0.3505	0.964	0.8207	0.2644	0.3166
	11	0.08548	0.5687	0.109	0.7727	0.4675	0.02065	0.6318	0.9942	0.9546	0.8628	0.4559	0.2752	0.06645	0.3193	0.5924	0.1293	0.06262	0.279	0.9994	0.3557

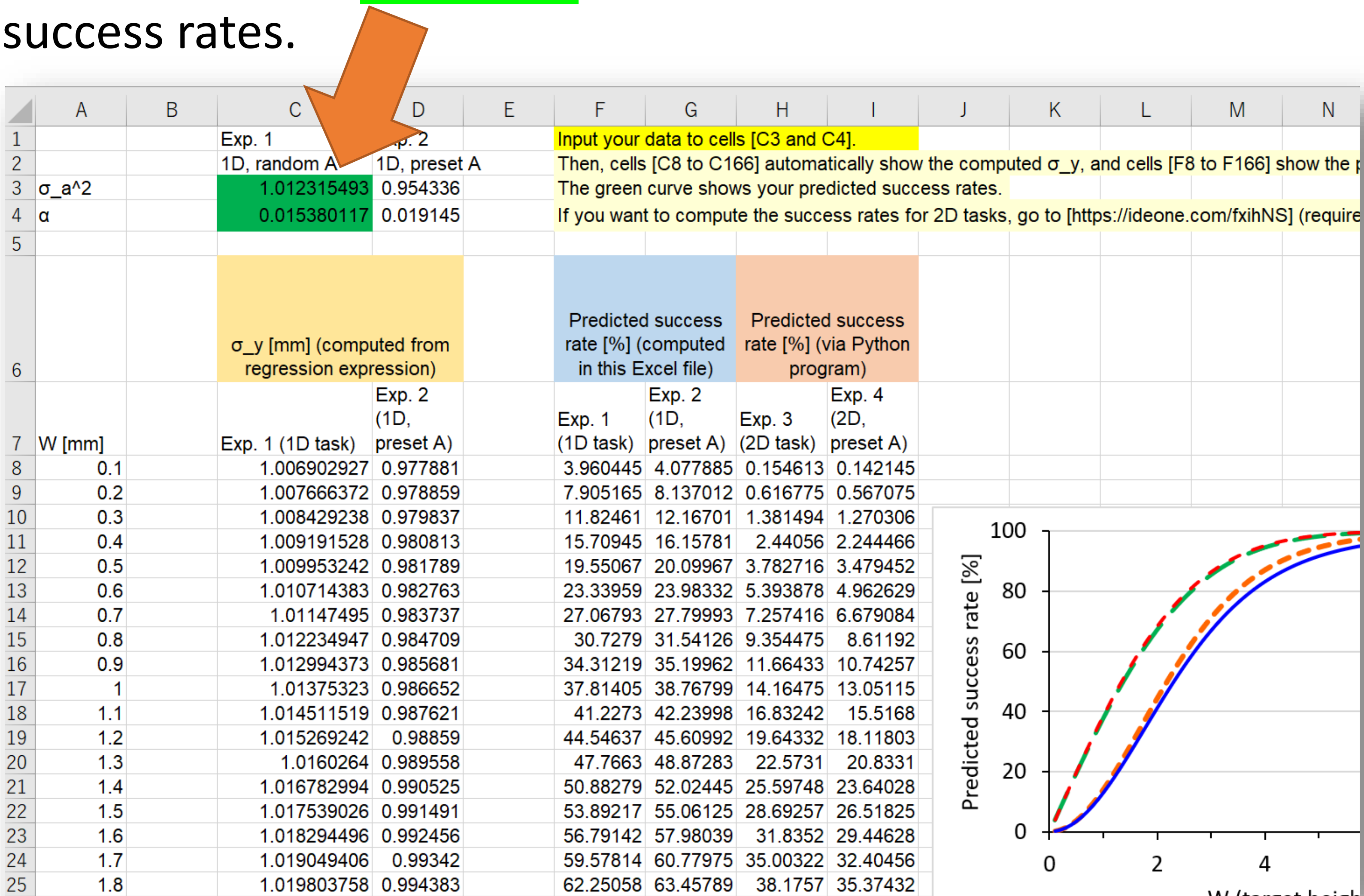
Bivariate

	A [mm]	20	20	20	20	20	30	30	30	30	30	45	45	45	45	45	60	60	60	60	60
	W [mm]	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10	2	4	6	8	10
participant #	0	0.2947	0.5095	0.002749	0.1018	0.06801	0.1341	0.000772	0.6154	0.1559	0.8086	0.04424	0.306	0.9559	0.1116	0.4144	0.01517	0.1413	0.3522	0.003741	0.7036
	1	0.06345	0.3687	0.2033	0.7346	0.1555	0.2361	0.01322	0.1526	0.08768	0.06415	0.01289	0.08951	0.007741	0.7369	0.03674	0.2557	0.5284	0.6913	0.05577	0.1686
	2	0.0389	0.2335	0.3697	0.8922	0.7938	0.3025	0.1253	0.4916	0.005258	0.55	0.4049	0.009115	0.002063	0.04239	0.05154	0.4615	0.1291	0.3506	0.3487	0.1874
	3	0.04382	0.2681	0.06031	0.3694	0.02995	0.1861	0.9614	0.07801	0.6069	0.06725	0.5685	0.1632	0.6561	0.07161	0.8388	0.5007	0.008432	0.008089	0.08687	0.2422
	4	0.1063	0.02008	0.002941	0.5009	0.05474	0.5437	0.45	0.7895	6.51E-05	0.8962	0.06449	0.2669	0.0829	0.01059	0.7906	0.05681	0.05508	0.5031	0.6191	0.6603
	5	0.08817	0.8861	0.8839	0.8421	0.4268	0.007724	0.5426	0.3789	0.01815	0.6714	0.7846	0.00252	0.257	0.009134	0.09701	0.03975	0.00415	0.08044	0.1524	0.01958
	6	0.8895	0.4291	0.02093	0.003011	0.656	0.1257	0.8946	0.5572	0.918	0.2004	0.3224	0.1452	0.2395	0.1185	0.2215	0.01204	0.174	0.1449	0.1905	0.1606
	7	0.2008	0.4301	0.06651	0.002564	0.4049	0.005563	0.05805	0.09895	0.01299	0.03053	0.1804	0.7434	0.4346	0.8844	0.9216	0.04665	0.1537	0.001016	0.6139	0.06762
	8	0.7112	0.6326	0.02076	0.9124	0.3013	0.5518	0.5329	0.8776	0.8437	0.08393	0.0001	0.02102	0.5327	0.2379	0.1561	0.07958	0.1597	0.8023	0.05614	0.001874
	9	0.219	0.007087	0.02365	0.1324	0.1309	0.4106	0.2184	0.07433	0.1033	0.02388	0.09322	0.9899	0.4045	0.002883	0.01471	0.8459	0.9721	0.2546	0.09901	0.5546
	10	0.2392	0.5325	0.3466	0.3164	0.001456	0.2537	0.9709	0.0151	0.01814	0.9817	0.3769	0.09545	0.4582	0.0292	0.1984	0.2105	0.5354	0.2933	0.9946	0.006927
	11	0.08506	0.8279	0.1252	0.008195	0.8114	0.01237	0.1604	0.9133	0.2134	0.0751	0.002886	0.1093	0.1173	0.06082	0.5007	0.3149	0.8102	0.01285	0.05962	0.3391

How to compute the success rate from your data

- After measuring the variance (i.e., $\sigma_{obs_y}^2$) of the tap points for each W, run a regression expression of $\sigma_{obs_y}^2 = \sigma_a^2 + \alpha W^2$ (Eq. 4). Or, in Excel, directly obtain
  - σ_a^2 by using the *intercept* function, and
  - α by using the *slope* function.

- For 1D tasks, simply use the attached Excel file.
  - Input these two values to cells **C3 and C4**; the spreadsheet then automatically calculates the success rates.



	A	B	C	D	E	F	G	H	I
1			Exp. 1	Exp. 2		Input your data to cells [C3 and C4].			
2			1D, random A	1D, preset A		Then, cells [C8 to C166] automatically show the computed σ_y, and cells [F8 to F166] show the			
3	σ_a^2		1.012315493	0.954336		The green curve shows your predicted success rates.			
4	α		0.015380117	0.019145		If you want to compute the success rates for 2D tasks, go to [https://ideone.com/fxihNS] (require			
5									
6			σ_y [mm] (computed from regression expression)			Predicted success rate [%] (computed in this Excel file)		Predicted success rate [%] (via Python program)	
7	W [mm]		Exp. 1 (1D task)	Exp. 2 (1D, preset A)		Exp. 1 (1D task)	Exp. 2 (1D, preset A)	Exp. 3 (2D task)	Exp. 4 (2D, preset A)
8	0.1		1.006902927	0.977881		3.960445	4.077885	0.154613	0.142145
9	0.2		1.007666372	0.978859		7.905165	8.137012	0.616775	0.567075
10	0.3		1.008429238	0.979837		11.82461	12.16701	1.381494	1.270306
11	0.4		1.009191528	0.980813		15.70945	16.15781	2.44056	2.244466
12	0.5		1.009953242	0.981789		19.55067	20.09967	3.782716	3.479452
13	0.6		1.010714383	0.982763		23.33959	23.98332	5.393878	4.962629
14	0.7		1.01147495	0.983737		27.06793	27.79993	7.257416	6.679084
15	0.8		1.012234947	0.984709		30.7279	31.54126	9.354475	8.61192
16	0.9		1.012994373	0.985681		34.31219	35.19962	11.66433	10.74257
17	1		1.01375323	0.986652		37.81405	38.76799	14.16475	13.05115
18	1.1		1.014511519	0.987621		41.2273	42.23998	16.83242	15.5168
19	1.2		1.015269242	0.98859		44.54637	45.60992	19.64332	18.11803
20	1.3		1.0160264	0.989558		47.7663	48.87283	22.5731	20.8331
21	1.4		1.016782994	0.990525		50.88279	52.02445	25.59748	23.64028
22	1.5		1.017539026	0.991491		53.89217	55.06125	28.69257	26.51825
23	1.6		1.018294496	0.992456		56.79142	57.98039	31.8352	29.44628
24	1.7		1.019049406	0.99342		59.57814	60.77975	35.00322	32.40456
25	1.8		1.019803758	0.994383		62.25058	63.45789	38.1757	35.37432

- For 2D tasks, compute σ_a^2 and α (on the x-axis) in the same manner as for the y-axis.

- Then, go to [https://ideone.com/fxihNS] and input the four values (i.e., σ_a^2 and α on the x- and y-axes) and run the program, which automatically calculates the success rates for W ranging 0.1 to 16 mm. Note: This website requires a login to change the parameters. Or use the Python program in our Supplementary Material.