Supplemental Material for "A Powerful Method to Test Associations between Ordinal Traits and Genotypes"

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In this supplementary material, we evaluated Type I error rates and power estimates of the proposed method at a lower significance level, 0.005. The simulation datasets were generated under the normal distribution (ND) mechanism (the same meaning as the phrase in the subsection **Simulation Results** and the caption of Table 1), with the same setting of covariance matrix as that in the main text. Assume that the Hardy-Weinberg equilibrium (HWE) was met and the minor allele frequency (MAF) only took on values from {0.1, 0.3, 0.5}. For each simulation scenario, we generated 3000 datasets, each consisting of 300 subjects, to calculate the P-values. The results are presented in the following Table S1. Note that the blank spaces in the table are results of almost unrealizability for the sample data generation. It can be observed that the proposed method can control the Type I error rate at this lower significance level and obtain power gains at the same time.

Table S1: Type I error rates and power estimates under the normal distribution mechanism (referring to the data generating process as that in Table 1) with significance level 0.005 (HWE holds)

θ	MAF	co-dominant			dominant			recessive		
		probit	logit	lvm	probit	logit	lvm	probit	logit	lvm
null	0.1	0.0037	0.0033	0.0053	0.0077	0.0057	0.0083	—	—	—
	0.3	0.0063	0.0063	0.0070	0.0070	0.0057	0.0063	0.0070	0.0063	0.0067
	0.5	0.0040	0.0040	0.0043	0.0033	0.0023	0.0080	0.0033	0.0040	0.0040
-0.2	0.1	0.1633	0.1120	0.2533	0.1693	0.1197	0.2487	—	—	—
	0.3	0.3813	0.3530	0.4447	0.3300	0.3107	0.3640	0.0460	0.0127	0.1740
	0.5	0.4347	0.4190	0.4837	0.2980	0.3040	0.3293	0.2253	0.1823	0.2940
-0.1	0.1	0.0310	0.0183	0.0667	0.0287	0.0187	0.0533	—	—	—
	0.3	0.0607	0.0560	0.0823	0.0550	0.0517	0.0660	0.0080	0.0017	0.0447
	0.5	0.0680	0.0633	0.0873	0.0497	0.0473	0.0583	0.0417	0.0320	0.0633
0.1	0.1	0.0297	0.0320	0.0393	0.0310	0.0330	0.0383	—	—	—
	0.3	0.0543	0.0547	0.0637	0.0377	0.0327	0.0477	0.0220	0.0277	0.0333
	0.5	0.0533	0.0517	0.0673	0.0197	0.0150	0.0390	0.0337	0.0353	0.0410
0.2	0.1	0.2080	0.2180	0.2353	0.1917	0.2003	0.2143	—	—	—
	0.3	0.3270	0.3180	0.3647	0.2450	0.2270	0.2803	0.1267	0.1393	0.1590
	0.5	0.3523	0.3310	0.3807	0.1657	0.1337	0.2337	0.2153	0.2200	0.2420